THE NATURAL HISTORY OF SOUTH AFRICA

F. W. FITZSIMONS

MAMMALS

VOL. IV.

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THE NATURAL HISTORY OF SOUTH AFRICA

The Natural History of South Africa

By F. W. FITZSIMONS, F.Z.S., F.R.M.S., etc. Director, Port Elizabeth Museum. With Illustrations from Photographs. Four Volumes. Crown 8vo.

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The Aard Vark or Ant-eater *(Orycteropus afer)* approaching a Termite hill. This large pig-like animal subsists entirely on termites commonly called "White Ants."

THE NATURAL HISTORY OF SOUTH AFRICA

INCLUDING THE JUMPING SHREWS, HEDGEHOG, SHREW, SQUIRRELS, DORMICE, GERBILLES, OTOMYS, RATS AND MICE, BLESMOL, SPRINGHARE, PORCUPINE, HARES AND RABBITS, WHALE, PORPOISE, DOLPHIN, ELEPHANT SEAL, ANT-EATER, AND AARD VARK

BY

F. W. FITZSIMONS, F.Z.S., F.R.M.S., &c.

DIRECTOR, PORT ELIZABETH MUSEUM

MAMMALS

IN FOUR VOLUMES

VOL. IV

WITH ILLUSTRATIONS

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THE NATURAL HISTORY OF SOUTH AFRICA

Order: INSECTIVORA

INSECT-EATING MAMMALS

The animals which are classified under this order are all Insect-eaters, as the name implies. Their teeth are specially adapted for crushing the hard body-cases of insects, and for chewing them up. The upper or molar teeth have sharp cusps or points arranged in a W- or a V-shaped pattern. The incisor or front teeth are not chisel-like, as is the case with all the Gnawing or Rodent group of animals, such as rats, hares, rabbits, etc.

In all the South African species or kinds of insect-eating animals, the canine teeth are small and can barely be recognised from the rest. Whereas with the Carnivora or Flesh-eating animals, the canine teeth are large and pointed, and can be recognised at a glance. There are a number of other differences which distinguish this order of animals from those grouped under the various other orders, with which a student may acquaint himself on reference to any technical work on Zoology.

The only animals of the Insectivorous Order in South Africa are the Jumping or Elephant Shrews, the Common Shrews, the Hedgehogs and Golden Moles.

THE JUMPING SHREW

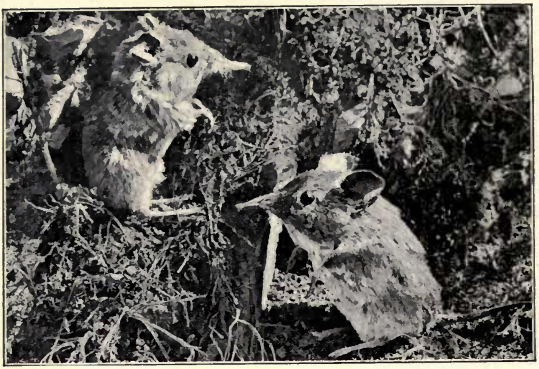
Also known as the Elephant Shrew

These curious-looking little animals inhabit Africa, and are not found in any other part of the world. They are known as Jumping Shrews because of their remarkable leaping powers. In fact, their only means of progression when running rapidly is by a succession of big jumps, owing to the smallness of the front legs in comparison with the back ones.

The name of Elephant Shrew has been given to them because of the elongated, trunk-like snout, giving the head somewhat the appearance of that of a miniature elephant.

There are several species or kinds of Jumping or Elephant Shrews inhabiting South Africa. All of them are of great economic value to man, for the reason that their diet consists almost entirely of insect life which they seek on the ground, and under dead leaves and grass. Their sense of smell is exceedingly keen, enabling them to locate insects concealed from sight.

In captivity we found they devoured with avidity almost any species of insect which we gave them.



The Jumping Shrew, also known as the Elephant Shrew because (1) it progresses by means of big jumps, and (2) because it has a snout resembling the trunk of an elephant.

The Rock Jumping Shrew *(Elephantulus rupestris typicus)*.

Failing insects, they may be kept in health and strength on a diet of mincemeat.

The Jumping Shrew may be regarded as one of the keepers of the sparse vegetation in those districts where the rainfall is limited. In these more or less arid parts, bird life is scarce. Insectivorous birds keep the armies of insects in check; and in the absence of these formidable enemies, the insects increase at an alarmingly rapid rate, and soon become a plague to mankind. However, owing to the comparative dryness of the soil, absence of surface water, and the sparse vegetation in the midlands of the Cape Province and various other parts of South Africa, insects do not increase at a rapid rate, and consequently their enemies are comparatively few, and the Jumping Shrew is one of them.

Some of the Jumping Shrews specially favour the dryer portions of South Africa on the west, from the Cape up through Namaqualand, Bechuanaland, South-West Africa, and right away to Algeria. These desert-loving species are usually found in and about thin patches of brushwood, where they excavate burrows into which they retreat on the appearance of their enemies the Hawk, Meercat, Mungoose and Fox.

If the observer sits perfectly quiet and carefully watches he will, after a time, see a portion of the trunk-like snout thrust out of a hole, and by its sensitive movements he is aware the Shrew is em-

ploying its powers of smell to ascertain if an enemy is near. Failing to detect a foe in this way, it raises its head and surveys its surroundings before again venturing forth.

Another tribe of Jumping Shrews, usually of larger size than their desert-loving cousins, inhabit the fertile districts of Africa from Port Elizabeth to the Equator.

One of the species of these East African Jumping Shrews inhabits rocky places, and conceals itself in the natural crannies and crevices of the rocks, or in burrows which it digs amongst the boulders, or between the roots of shrubs, or in decaying logs. In these shelters it builds a cosy nest of grass which it cuts up with its teeth.

Another kind or species favours the bush-veld, and localities where there are patches of dense bush. It lives in burrows in the ground and in old termite mounds.

The species of Jumping Shrew whose habitat is chiefly the arid districts of the western part of South Africa has five toes to each foot, whereas those inhabiting the fertile eastern parts of the country possess five toes to the front feet, but the back ones have four. In addition to this difference, they are much larger in size. On this account they have been separated from the others and placed in a different genus. To others than Zoologists, the term Genus may not be clearly understood, and perhaps requires a little explana-

tion. For instance, a number of small animals are placed before us. At a glance we know they are all Jumping Shrews, because they possess the general shape of this family of mammals. We examine them more closely, and discover some have four toes to each of the back feet, and others have five toes. Looking up a technical book on Zoology, we find that those Jumping Shrews which have five toes to each foot are grouped by themselves under what is called a Genus, and the name given to that genus is *Macroscelides*, and that those which have only four toes to the hind feet are placed under quite another genus, known as *Petrodromus*. Now the reason for this is, or should be, quite clear. Knowing the difference in regard to the number of toes amongst the Jumping Shrew tribe, we can easily classify them, for all those with four toes to the hind-feet we pronounce as belonging to the genus *Petrodromus*. Having satisfied ourselves as to what genus the animal belonged, our next endeavour is to find out what kind or species it is. On examining a number of Jumping Shrews, for instance, each of which possesses five toes to each foot, we find various minor differences. We notice some have broader skulls than others; some have longer noses, shorter tails, the teeth are slightly different in shape; the bodies differ in size, colouring, etc. After a great deal of patience and careful examination we at last separate them, so that each lot shall be practically identical one with another.

These, we say, all belong to one kind or species. We again refer to our technical books, and find out the name which has been given them. If we fail to identify them, then we forward them to a specialist on the subject; and if he finds they are a kind unknown to science, he gives them a name by which they are ever afterwards known. Supposing a Jumping Shrew was handed to a Zoologist who had never seen such a creature before, and you asked him to classify it. He would examine its anatomy, principally the teeth, and would pronounce it to belong to the insect-eating order of animals. Turning up his books he finds it is one of the Jumping Shrews. Again examining its anatomy, he soon discovers to what Genus and Species it belongs. He would then classify it after this fashion:

Order: INSECTIVORA.
Family: MACROSCELIDIDÆ.
Genus: *Macroscelides.*
Species: *Macroscelides proboscideus.*
Common name: Cape Jumping Shrew, otherwise known as the Elephant Shrew.
Distribution: Cape Province.

We often find that animals of the same species or kind, living in different parts of the country, differ from one another usually in size and coloration, owing to differences in the food and environment. When we find this out, we dis-

tinguish the various kinds by calling them sub-species and giving them a third Latin name. For instance, the Jumping Shrew, known as *Elephantulus rupestris*, is found to differ slightly in various parts of the country, so in order to distinguish it from the others, we call it *Elephantulus rupestris typicus*. In South Africa there are two sub-species of this kind of Jumping Shrew, so we say there is the typical species, and two sub-species, viz.:

1. *Elephantulus rupestris typicus.*
2. ,, ,, *myurus.*
3. ,, ,, *jamesoni.*

The following are the species and sub-species of Jumping Shrews which inhabit South Africa.

THE CAPE JUMPING SHREW

(*Macroscelides proboscideus*)

The Cape Jumping Shrew inhabits the dryer portions of the Cape Province, and seems to be generally distributed both east and west. It has not yet been recorded beyond the confines of the Cape Province. It lives in burrows in the ground out on the arid veld, in localities which afford some cover in the way of vegetation. In situations where enemies are not numerous, it seeks its food by day, and delights in the warm sunshine. When harassed by hawks and other enemies, it hides by day and

issues forth at dusk. When alarmed, it bounds off with great leaps to its burrow, into which it disappears. Its food consists of insects and their larvæ. Termites are a favourite food when procurable. At certain seasons these Termites or "White Ants" send off from their colonies hosts of fertile winged males and females; and at these times the Jumping Shrews have a right royal banquet, for these winged Termites very soon lose their wings and fall to the ground or settle on the herbage, from which they are captured by the Jumping Shrews, which hop up and secure them with a snap of the jaws.

The Cape Jumping Shrew is about 5 inches in length, not including the tail, which averages $4\frac{3}{4}$ inches. When examined anatomically, it will be found to differ from other species in the following ways:

(1) It has ten teeth on either side in the lower jaw.

(2) The ears are oval, long and brown.

(3) The hind-foot measures 1·15.

(4) Sandy-brown on the back and sides, with a faint reddish tinge; under parts white. On close examination the thick soft fur on the back will be seen to be slate-coloured for two-thirds and more of its length from the base, the tips only being sandy-brown.

BLACK-EARED JUMPING SHREW

(*Macroscelides melanotis*)

THE Black-eared Jumping Shrew is an inhabitant of the parched and arid wastes of Namaqualand and South-West Africa.

Like the Cape Jumping Shrew, it preys on insect life, and when hard pressed for food it eats tender shoots, roots and berries.

The Black-eared Jumping Shrew is sandy-brown on the upper parts, with a slight reddish tinge, stronger on the sides; under parts white. It differs from the Cape Jumping Shrew in the following ways:

(1) Ears are shorter, broader, rounder and black.

(2) The hind-foot measures 1·35.

(3) It is 4 inches in length, exclusive of tail.

(4) The tail is longer in proportion to the length of the body than in the Cape Jumping Shrew.

THE ROCK JUMPING SHREW

Also known as the Rock Elephant Shrew

(*Elephantulus rupestris typicus*)

THE Rock Jumping Shrew inhabits the Cape Province both east and west, and has been recorded from the vicinity of the Orange River, from the Transvaal, and northwards to Benguela. In the

Port Elizabeth Museum there are several from Aloes, which is near Port Elizabeth.

These Jumping Shrews inhabit rocky localities and scrub-covered, rather stony lands, and live in crevices amongst the rocks, and in holes under boulders. They usually associate in colonies, and make a common nest in a large cleft in the rocks. The nest is composed of twigs and grass, and sometimes scraps of rag or paper are added, and has the appearance of a crow's nest. The inside is lined with soft grass.

Jumping Shrews can extend or retract the proboscis at will.

Often solitary individuals or pairs are met with, which inhabit the smaller crannies and crevices amongst the rocks.

Shrews when alarmed, or endeavouring to detect the scent of an enemy or the locality of an insect, retract and elongate the snout in a curious manner. They lie hidden away in their nests in the rock crevices during the heat of the day, and usually issue forth in the afternoon and evening. They love to bask in the sun's rays, and sit upright like Meercats.

The colour of these Shrews blends perfectly with their surroundings, and these timid little creatures seem well aware of the fact, for, when walking on the rock-strewn veld or sloping hill-sides, I have often noticed what was apparently a small, round, grey stone on top of a boulder. On careful scrutiny, the supposed pebble would turn out to

be a Jumping Shrew with body bunched up and immovable, but very wide awake, for, on realising it had been observed, it would bound off with prodigious jumps, and so rapidly that a mere momentary glimpse of it would be seen, leaving a feeling of uncertainty whether the eyes had not been deceived by the passing shadow of a bird.

When moving at leisure they walk on all-fours.

They are exceedingly timid little animals, and usually die of fright when captured and held in the hand.

Master Noel Leppan, who is a keen young naturalist, has sent me several of these Jumping Shrews from Thorngrove, Somerset East District of the Cape.

Their food, like that of the other species, consists of insects. They may sometimes be seen on the outskirts of clumps of brushwood, or amongst the rocks, disporting themselves in the sun, or hunting for insects. On the slightest cause for alarm, such as the breaking of a twig, or the scent of an enemy, they bound off to their retreats in the cracks and crannies of the rocks. Jumping Shrews are beset on all sides by enemies. The watchful Hawk is ever ready to drop down upon them; a dozen kinds of carnivorous animals regard them as choice morsels; snakes lie in ambush ready to enfold them in their coils, to paralyse them with their terrible venom, or to penetrate to the innermost recesses of their retreats and make a meal of them.

This appalling struggle for the survival of the fittest has been going on for millions of years—ever since the beginnings of life on our world. It is still as keen and merciless as ever in the lower animal world.

Man is constantly interfering in this struggle, usually with the result that the balance of Nature is unwisely upset, and he brings calamity upon himself in consequence. This unreasoning, wilful interference with the creatures of veld, forest, mountain and stream is alarmingly common. When Man is less under the dominion of prejudice and destructiveness, and is guided by an educated intellect, he will learn that a considerable number of the lower animals are valuable allies, and instead of, as at present, upsetting the balance of Nature as he is now constantly doing, he will be able to maintain the balance and control it for his special advantage.

In regard to its breeding habits, Bertie van Musschenbrock writes me as follows:

"I caught one of these Jumping Shrews, and she had two young ones. These were hanging on to something on top of the shoulder blades. On examination I found they were two teats, one on either side. I kept this little animal a few days to watch its habits. She suckled her young and carried them by these teats she has on her shoulders. She lived on ants, beetles, etc. She seemed very fond of her young, because when I let her go, she

took good care to see that they were hanging on securely before she hopped away like a miniature kangaroo."

The Rock Jumping Shrew is about 5 inches in length, not including the tail, which is the same length as the body—sometimes the fraction of an inch longer. The chief characteristic which distinguishes this species from the others already mentioned is a difference in the shape of the skull, which is long and narrow. A study of the drawings of the skull of the Black-eared Jumping Shrew in comparison with that of the Rock Jumping Shrew will make this difference apparent.

When the external differences are slight, the only sure method of correctly identifying a species is by an examination of its skull and teeth. Now, in the case referred to, if there was no external difference noticeable, the fact of the two skulls and teeth being so very different in shape and arrangement would be sufficient grounds for making a new species of it.

There are two local races of the Rock Jumping Shrew, which have been named as follows:

Elephantulus rupestris myurus; Elephantulus rupestris jamesoni.

THE PALE JUMPING SHREW

(*Elephantulus intufi*)

The Pale Elephant Shrew has been obtained from the Transvaal, South-West Africa, and

northwards as far as Angola, indicating that it is one of the species which inhabit the dry, western tracts of country. It is in size about the same as the preceding species, but differs in the following ways:

(1) The colour of the fur of the upper parts is much lighter than in the other species, being greyish-yellow.

(2) The under parts are white, and the line of demarcation between this and the colour of the back is very pronounced.

(3) Skull and snout comparatively short.

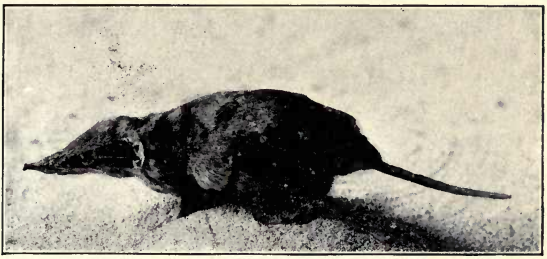
(4) Ears slightly pointed, with a scanty covering of short hairs, which are yellow on the front part, and white anteriorly.

(5) A ring of white hairs round the eyes.

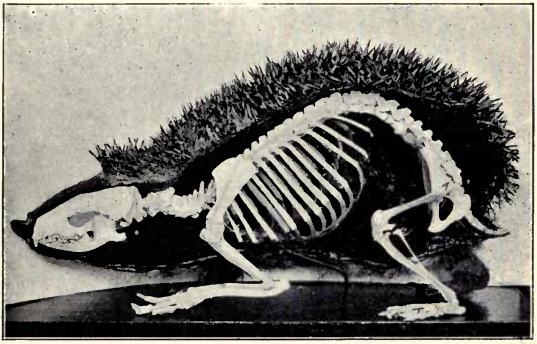
SHORT-SNOUTED JUMPING SHREW

(*Nasilio brachyrhynchus*)

The Short-Snouted Jumping Shrew seems to be generally distributed in the northern parts of South Africa, for it is recorded from both east and west, viz. Bechuanaland, Transvaal and Rhodesia. From these districts it extends northwards and eastwards to Nyassaland. This species of Jumping Shrew averages 4¾ to 5 inches in length, not including the tail, which is about the same length as the head and body. It can be recognised in the following ways:



The Shrew wages war on noxious insect life.



A Hedgehog half-skeletonized.

A family of South African Hedgehogs.

(1) The fur on the back is rich reddish in colour, the extreme tips of the hairs being black.

(2) Snout short and tapering.

(3) Ears slightly pointed and sparingly covered with greyish hairs.

(4) There is an extra molar in the lower jaw, making eleven teeth on either side.

(5) In the upper jaw there are spaces between the teeth; in the lower jaw they touch one another.

THE FOUR-TOED JUMPING SHREW

(Genus: *Petrodromus*)

The Four-toed Jumping Shrew inhabits the East Coast districts from Gazaland to Mozambique. This Shrew differs from all the preceding ones in two very important ways. It is nearly twice as large as any of those already dealt with. It has four toes to each of its hind-feet, instead of five, as is the case with the others.

The Four-toed Jumping Shrew inhabits rocky districts, where it lives in the clefts and crannies of the rocks, which it enlarges or deepens if necessary to suit its needs. In these situations it is more secure against many of its enemies, such as the Honey Ratel, which, in spite of its efficient digging powers, cannot dislodge the Jumping Shrew when at the bottom of a crevice in a mass of rocks. Nyakale is the name given to these Shrews by

the natives near Inhambane. They have soft, thick fur, which on the back is brown, with a slight rufous tinge, and the under parts are rusty-white. Length of body from nose to root of tail about 8 inches. Tail $6\frac{1}{4}$ inches.

There are three species which have been recorded in East Africa south of the Zambesi. They are named *Petrodromus tetradactylus*, *Petrodromus schwanni* and *Petrodromus beiræ*.

LONG-NOSED JUMPING SHREW

(Genus: *Rhynchocyon*)

The Four-toed Jumping Shrews must not be confused with the Long-nosed Jumping Shrews which inhabit the regions adjacent to Zanzibar, but which so far have not been recorded south of the Zambesi, although it is very probable they will be found in its neighbourhood.

These Long-nosed Jumping Shrews, although similar in size to the Four-toed Jumping Shrews, may at once be distinguished in the following ways:

(1) The proboscis or snout is long.

(2) There are thirty-six teeth, instead of forty, as in the Four-toed Jumping Shrew.

(3) Both fore- and hind-feet have four toes.

(4) The hind limbs are relatively shorter than the other Jumping Shrews.

THE SOUTH AFRICAN HEDGEHOG

(Erinaceus frontalis)

ALTHOUGH there are a considerable number of species or kinds of hedgehogs, only one is found in South Africa. Two species inhabit Central and Northern Africa. One, viz. the well-known European Hedgehog, is native of the British Isles, Europe and a portion of Asia; and several species have their habitat in India.

The hedgehogs are divided up into so many species or kinds because of minor peculiarities of structure. In general appearance they differ but slightly from each other.

The South African Hedgehog occurs from the midlands of the Cape Province northwards as far as Benguela. In Natal it is rather rare, or at least I have found it so. I have only met with it in the neighbourhood of Pietermaritzburg. At the Port Elizabeth Museum we have received twenty or more live specimens from the Kimberley, Steynsburg, Middelburg and Cradock Districts of the Cape Province. It seems to be commonest on the Karoo-veld.

Life upon this planet is truly a survival of the fittest, and in the sub-human animal kingdom the

creatures which succeeded in evolving the most effective methods of protection against their enemies, are those which survived and perpetuated their kind throughout the long ages of time to the present day.

The Hedgehog seems a helpless sort of little creature, for it lives above ground and is slow in its movements, and apparently it is at the mercy of the host of alert and ever-watchful carnivorous animals and birds of prey. But its helplessness is only apparent. Its back is thickly studded with sharp, quill-like spines, each of which is about an inch long. By the aid of a wonderful set of highly-developed muscles under the skin, the Hedgehog is able to roll itself up into a tight ball, so that the spines stick out in all directions, and so tightly does it coil up that no portion of the unprotected parts are visible. The head and feet are neatly tucked up against the abdomen. Lying rolled up in this manner, few carnivorous animals are bold or foolish enough to attack it.

Although South Africa is swarming with carnivorous animals, the little, slow-moving Hedgehog, out upon the exposed Karoo, has succeeded in holding its own in the struggle for existence.

The chief enemies of the Hedgehog are the larger birds of prey. With their powerful, curved, horny beaks, they tear away the prickly spines and devour the tender body of the animal.

The Carrion Crow sometimes seizes a Hedgehog

with its beak, and flying high into the air, lets it fall to the ground. This kills or stuns the creature, whereupon the constrictor muscles relax, and the unprotected parts are exposed.

Hedgehogs, although of low organisation among the mammal class of animals, have, owing to their effective spiny armour, been enabled to survive from remote times, for their fossil remains have even been found in the Tertiary rocks of Europe in the period known to geologists as the Oligocene.

The South African Hedgehog is usually seen astir about sundown. During the day it lies asleep, hidden away among the dead leaves in the midst of thick brushwood, in a hedge, tuft of grass, under a low bush or any other form of favourable cover. It is occasionally seen on the prowl during the daytime, but not often, for the reason that its chief enemies, the far-seeing birds of prey, are ever on the watch, and the stately Secretary Bird is likely to come stalking along with majestic stride at any moment, and once seen by it, the Hedgehog's lease of life is at an end. Then, again, the snails, slugs, caterpillars, beetles and other insects which furnish the Hedgehog's chief diet, issue forth from their retreats in great numbers after sundown, and during the night.

The Hedgehog does not confine itself to snails, slugs and insects. Snakes' eggs and lizards form a welcome addition to its diet. If it should encounter a snake it immediately attacks it, if it be

not too large, receiving the blow of the snake on its prickly back. The snake, with bruised and punctured mouth, withdraws in pain, and before it can recover, the Hedgehog seizes it by the head or neck and holds on till it crushes the vertebræ. It then inflicts a series of sharp nips along the snake's back, with the object of crushing the backbone in several places, and thus rendering the reptile utterly helpless. When attacking a snake, the Hedgehog is careful to keep its unprotected head and legs well out of reach of its intended prey's deadly fangs. It is not naturally immune to snake venom, as has been stated. Reading a statement in a scientific journal to the effect that the European Hedgehog has been shown to be immune to snake venom, I conducted some experiments upon South African Hedgehogs with a view of ascertaining if they were immune; or, if not, then the degree of natural resistance possessed by them against snake venom.

A drop of Cobra venom rapidly killed an adult Hedgehog. Two drops of Puff Adder venom injected under the skin of the thigh caused severe subcutaneous hæmorrhage, swelling and death in one hour and three-quarters. Similar doses of Puff Adder venom were injected into ordinary fowls and they recovered. Another Hedgehog succumbed to a drop and a half of Puff Adder venom. A venomous snake is capable of injecting ten and more drops of venom at a bite. Five drops is the usual quantity,

therefore we cannot claim the Hedgehog is even highly resistant to snake venom, for a young venomous snake a foot in length is capable of injecting from two to four drops at a single bite. If a Hedgehog living in a country teeming with snakes is not immune to snake venom, it is highly improbable that the European Hedgehog would be otherwise, for the only poisonous snake it is ever likely to encounter is the European Viper. Nature would be, therefore, wasting her energies in rendering an animal immune to snake venom for no purpose.

Snakes are not destroyed by the little Hedgehog merely for sport. They furnish a delicious meal, for their flesh is soft and juicy. Rats and Mice also form part of the diet of this unique little creature. It preys largely upon the Striped Field Mouse (*Rhabdomys pumilio*), which swarms all over South Africa, on the veld, hill-sides and bushy country.

These mice build their nests in low shrubs, in tufts of grass, between the roots of trees, and crevices among stones. In these nests the young are born and reared. The number produced at a birth averages from five to ten, and, like all the rat and mouse family, the Striped Field Mice breed frequently. If these rodents were allowed to multiply unchecked, they would soon become a fearful scourge to the farmer and gardener. Happily, however, they have many natural enemies, and the Hedgehog is one of them. Seeking out the nest,

it devours the helpless young, and thus aids considerably in keeping these mice in check.

From the human point of view the only harm done by the Hedgehog is that it occasionally eats the eggs and young of ground birds, but this is of little consequence in comparison with the number of rats, mice, venomous snakes and the hosts of insect pests it destroys. It does no damage to vegetation, but will occasionally nibble fallen fruits. The Hedgehog is often captured by colonists and tamed. However, in the majority of cases, owing to ignorance of the kind of food it requires, it dies after being in captivity for a few days. In this way large numbers of these useful little animals are killed. The native herd boy often does much mischief by reason of his destructive propensities. He is ever on the prowl, and no creature of veld, forest or mountain is safe from him. Finding the nest of a bird he marks the spot, and returning at a time when the young are fat and well grown, he wrings their necks, spits them on a stick, and grills them over a fire of twigs. With the aid of a mongrel dog, he scours the veld and easily finds the innocent little Hedgehog in its lair. Dragging it out he kills the creature, and removing its skin, prepares it to suit his fancy, and wears it as a trophy, making a meal of the flesh. Thus are countless numbers of eminently useful birds and animals destroyed, creatures which are provided by the Creator for maintaining the balance of

Nature. The harm done to the country by this wholesale destruction of our animal friends is more serious than is generally realised, and the part the Kafir and Hottentot herd boys take in it is great, as I have reason to know from a lifetime of personal experience and observation of native boys and men.

In captivity the Hedgehog, when properly caged and carefully fed, thrives and becomes very tame, eating food from the hand. It is useful in the house for destroying cockroaches and other house-frequenting insects.

I have succeeded in keeping Hedgehogs for long periods alive and in good health on a diet of mince-meat and eggs, both raw and cooked; supplemented by snails, worms and various insects. However, unless kept in a warm and cosy cage they soon perish. They should never be given a starchy diet and milk, as these foods cause indigestion, and fermentation in stomach and bowels.

In a garden infested with slugs and snails, Hedgehogs are of great service, but it is necessary to surround the garden with a low fence to keep them from straying. They burrow in loose ground, and unless a portion of the fence is sunk into the ground they may scratch away the soil and escape under it.

The Hedgehogs which I have kept in captivity usually slept during the day, and became active towards sundown. On dull days they often woke up and began wandering about their cage. When put out into the warm sunshine, however, they at

once became active, and diligently searched the ground for insects. On the approach of winter the Hedgehog retires to a cosy nest of moss, dead leaves, grass, dense brushwood, or any other form of hiding-place in the vicinity, and, coiling up, it becomes torpid and lies thus until the return of the summer season. On warm winter days in South Africa, the Hedgehog, in favourable localities where insect and other food is procurable, may occasionally be met with walking abroad. I have at times during the winter months seen it busy eating what are known as White Ants (Termites), which it obtains by scraping away a small portion of the hill in which they live. When the surface of a termite hill is broken, the inmates swarm out to investigate, and are then easily licked up by the Hedgehog.

The South African Hedgehog is covered with spines on the back and sides. Each spine is yellowish-white at the base and for two-thirds its length, followed by a black band, and tipped with buff. When kept for a long time in captivity, and not exposed to the sun, the buff and yellowish colour fades away, and the spines become pure white, with a black band.

The South African Hedgehog can at once be distinguished from its European cousin by the presence of a white band which extends from the bases of the lips over the forehead.

An adult Hedgehog is about 7 inches long, and when rolled up is of about the bulk of a plough-

man's fist. The tail is a little worm-like thing, less than an inch in length.

As is the case with most other animals, albinism occurs among Hedgehogs. A friend captured an albino on the Karoo and had it alive for some time, and on two or three occasions I have seen partial albinos. If thrown into water the Hedgehog will not drown. It sinks deep into the water, the ends of its spines only being exposed, and elevates its nose. In this manner it can easily swim a considerable distance, and does so when occasion requires such efforts, as in cases of flood, and when desirous of crossing a stream.

The young are born in a nest composed of dead leaves, moss, lichen or grass, which is placed in a crevice, between the roots of a tree, under a dense shrub, in a shallow hole, or in the centre of a thick tuft of grass. The number of young born at a time varies from two to four. They are blind at birth and cannot roll themselves up, as do the adults, and the spines on the back are soft, pliable and white. The young are born during the summer season.

Sometimes when terrified or in pain the Hedgehog unrolls its body and gives vent to loud, discordant, pitiful cries.

In January 1913 a mother Hedgehog and four little ones were sent to me from the midlands of the Cape Province. The youngsters were about two months old at the time, consequently they

must have been born some time in November. I kept them in an enclosure in a warm, sheltered situation along with several others which were adult. They never quarrelled or squabbled over their food, as is the case with most other species of animals. After becoming familiar with their new quarters they frequently uncoiled and lay at full stretch facing the sun, so as to expose their under parts to his warm rays. The crackling of a twig, or the approach of the household cat or dog was the signal to close up tight. One of the adults tunnelled a hole in the loose earth against one of the wooden sides of the enclosure, through which it and two others escaped.

The following day, hearing my terrier barking furiously, I went along to see what was the cause of his excitement. I expected to find him tormenting a snake. To my surprise it was a Hedgehog. I concealed myself and watched, curious to see what would happen. The dog rolled the Hedgehog over and over with his paws, tilted it with his nose, gnawed sideways at it; eventually he lay down, panting and exhausted. Then he moved off a few paces, and lying flat on the ground, watched the round, bristly ball, which defied all his efforts to rend asunder. Presently the ball began to move, then a little sensitive nose was thrust out. Failing to detect the presence of the dog by scent, the Hedgehog, with a jerk, released its body and peeped out from under its bristling coat of spines. Spying

a bush near by, it raised itself on its weak-looking legs and trotted off. The terrier was on it again in an instant, and made a desperate thrust with his nose under and upwards with the intention of getting a grip of its unprotected abdomen, but the Hedgehog had already closed up with a snap, and the dog's jaws came on the sharp spines. With a howl of pain and fury he lay down and pawed desperately at the bristly ball, but the spines dug into the tender skin between the toes. I thought now surely he will give in and leave the Hedgehog in peace. No, he had no thought of retreating. He lay glaring at the round ball, evidently trying to evolve some way of getting even. Suddenly he jumped to his feet and began digging with furious energy, to the accompaniment of sharp barks and growls. For a time his intention was not apparent to me. He appeared at first to be tearing up the grass and soil in impotent fury, but presently his object was made clear, for, after excavating a hole nearly a foot in depth, he deliberately rolled the Hedgehog into the cavity, and using his nose for a shovel, filled in the hole and rammed down the soil with his paws. Then, surveying his work with a look of satisfaction, he trotted off. Considering it was my turn now, I strode forward and dug up the entombed Hedgehog, which was none the worse for its adventure.

When suckling her brood, my captive mother Hedgehog lay upon her side and extended her body

while the little ones eagerly sought for her teats. It was most amusing to watch them trotting after their mother wherever she went, and endeavouring to get a drink. She would bear the pestering for a time, then, growing weary of their attempts to snatch a drink before the regular feeding time, she would roll up, and the youngsters, finding themselves baffled, also coiled up and slept. After a little while she would poke her head cautiously out, and seeing her children asleep, would steal silently away to hunt in peace for insects in the loose mould in her enclosure. We were in the habit of collecting worms and the larvæ of various insects and burying them in the loose soil of the Hedgehog's enclosure, in order to study the way they sought them out and devoured them. Hard-shelled insects, such as beetles, were deliberately chewed up, the hard wing, body and leg-cases being broken to tiny fragments by the teeth of the Hedgehog, which are specially adapted for such a diet. Worms and slugs were slowly chewed, first by one set of molars, then by the others, with the greatest deliberation. To test the biting power of the Hedgehog I offered one of my forefingers, which it bit repeatedly, but its teeth failed to penetrate the skin.

A Hedgehog can fall from a considerable distance on to hard ground without other injury than some broken spines. The instant the creature finds itself falling, its head and hind-feet snap together, join-

ing the anterior and posterior parts of the spiny armour.

The family of four Hedgehogs referred to grew rapidly until the diet of insects and meat was supplemented by bread and milk. After a few days one died, then a second and third. On dissection the cause of death was made clear. The bread and milk not being a natural diet, the digestive juices were unable to cope with it, and the food fermented and caused dilatation of the stomach and intestines. The fourth Hedgehog recovered on being put on a diet of raw mincemeat. At the age of twelve months it was adult, and for two years it was on exhibition in a cage in the Port Elizabeth Museum. It got a big ration of raw mincemeat once each morning, which it usually ate at a meal. Then it coiled up and slept until about sundown, when, in response to an inherited instinct, it became active. Several Hedgehogs inhabited the same cage. All of them coiled up in a corner, and looked like a number of sea-urchins. In the same cage with the Hedgehogs there was a Moholi Galago, otherwise known as a "Bush Baby," from Rhodesia, which lived on very friendly terms with the Hedgehogs.

During the winter these captive Hedgehogs became rather torpid, but roused themselves to devour their rations of mincemeat every morning. The temperature in the Museum during the winter months ranged from 60° to 65° F. When the

temperature of the air of the cage was raised artificially to 75° to 80° F., the Hedgehogs woke up and began running about.

When frequently handled and fed by hand they became very tame, and would not coil up when touched. It is impossible to give Hedgehogs their liberty in a house, for, however tame they may be, they wander away at the first opportunity.

Hedgehogs are delicate little creatures, and need to be kept in a warm, sheltered place and well fed, or they will languish and die. They are very susceptible to a change of environment, and for a time must be specially cared for. I have often obtained Hedgehogs from the Karoo, and succeeded in keeping them in health at Port Elizabeth for years.

The Hedgehog occasionally utters a low grunting sound which sometimes rises to what might be termed a grunting whine or squeak.

When frightened, the South African Hedgehog emits a grunting sort of hiss by ejecting air forcibly through its nostrils.

One of several captive Hedgehogs already referred to which escaped, found sanctuary in a thick mass of maidenhair ferns in my conservatory. When busy one day turning it over in search of caterpillars, my hand was pricked by something sharp, and at the same instant I heard a hiss. Taking it for granted a snake had bitten my hand, I took from my pocket a "First-Aid Snake Bite Outfit,"

and ligaturing my wrist I made two incisions with a lancet over the site of a puncture on the back of a finger, and rubbed the cuts full of powdered potash permanganate. Then my destructive instinct gripped me, and seizing a small rake I pushed a mass of fern aside and disclosed, not a snake, but a Hedgehog.

THE SHREW

THE Shrews are popularly called Shrewmice because of their mouse-like bodies. Shrews are widely removed in relationship to mice, for they belong to the Insectivorous or insect-eating tribe or order, and the mice are members of the Rodent or Gnawing tribe. Even a casual, superficial inspection will enable any one to distinguish a Shrew from a Mouse. The Shrew has a long, pointed snout, its ears are round and lie close to the sides of the head; the teeth are altogether different to those of a mouse, and the skull is long and narrow.

Shrews have a very wide distribution—more so than any other family of insectivorous animals. They inhabit America, Europe, Africa and Asia, except in the colder northern regions. They are also found in a large number of islands adjacent to these continents. The majority of Shrews are terrestrial, but some species have adapted themselves to an aquatic life and have developed webbed feet. They are all insectivorous, their food consisting chiefly of insect life, and in consequence they are the allies of man, for they render him the most valuable of services, and exact no toll on him in return, as do many other creatures. They not

only devour noxious insects, but they also prey largely on the young and even adults of the grain-eating field mice. Shrews, like mice, are secretive little creatures. In fact, they are more timid than mice, for they evidently realise their inability to escape when surprised at any little distance from dense cover, as, unlike the mouse, they are rather slow in their movements. Shrews are found wherever insects are abundant, which is usually in cultivated lands and fertile vegetation-covered areas. I have found them in shrub-covered, rocky localities, in the dense forests, out on the grass-veld, in sod fences, outhouses, and in dwelling-houses. They make their lairs in the rotten interiors of fallen trees, in crevices, in burrows, in dense brushwood, tufts of grass, amongst the roots of trees, under lumber, or any place where they may hide themselves from their enemies, and at the same time secure shelter from wind and rain. I have several times discovered Shrews' nests in old tins, shoes, and even in glass bottles. The parents seldom sought to escape by running. Crouching down, they raised the head, showing the peculiar front teeth. At the same time the long, sensitive snout contracted, distended and moved about at a rapid rate. In one nest composed of fine grass and some moss, at Port Elizabeth, in the month of October, I found four little pink, helpless young Shrews. In another nest of fine grass in an old shoe I found three little ones.

The number of young at a birth varies considerably, at least in Europe, where it averages from four to seven, and sometimes more. In South Africa I have never found more than five in a nest, or in a pregnant female. The young when born are blind, helpless and toothless.

Shrews begin to breed as soon as the warm weather sets in, and cease in the autumn. October, November and December were the months I generally found nests of young Shrews.

In Europe and other countries where the winter is very cold, and insect life exceedingly scarce, the Shrews seek out some snug, sheltered situation, and hibernate until the return of the warm weather, which brings with it an abundance of insect life. Shrews vary in their habits in the winter in South Africa. In those districts where the winter is very cold and sharp frosts prevail, the Shrew lies dormant and bereft of the power of movement. It is usual, however, in South Africa during the winter months for the late afternoons, nights and mornings to be very cold; but towards midday and during the early part of the afternoon the sun's rays cause a rapid rise in the temperature of the air. This midday warmth galvanises the Shrews into activity, and they issue forth in search of food, which can be obtained to a limited extent. To satisfy their appetite at these times they do not hesitate to devour one another. Even during the summer-time, should two males meet, they fight fiercely,

and if one is killed the other eats a portion of the body. In captivity it is necessary to keep them apart, for if several are kept together it will be truly a case of the survival of the fittest, as eventually there will be but one survivor, he having earned the right to live by reason of his superior physical strength, for "Might is Right" in the lower animal world.

It is a wise provision of Nature to have evolved the instinct in the flesh- and insect-eating animals to devour one another when hard pressed by hunger; or to fight to the death when one encroaches on another's preserves. If this were otherwise, the forms of life on which they prey would be annihilated. The Shrews are an instance in point, for if through an undue increase in their numbers, or from any other cause, insect life becomes scarce, they must of necessity eat one another or die of starvation. In this way the most virile of their race survives, and by reason of the diminution of their numbers, insect life once again increases and the balance is restored.

Shrews hunt for their food at all times both day and night, and in this respect their habits vary according to their environment. If insect life is more abundant by day, and enemies not too numerous, Shrews may be seen abroad in the daylight. If, on the other hand, enemies harass them by day and food is easier to obtain by night, then the Shrew hides away during the daytime and is active by night.

This little animal has tiny eyes, but his powers of smell are exceedingly keen, and it is chiefly by means of this sense he finds his food. Out on the open veld the Shrew is cautious in his movements by day, lest a hawk should spy him out and drop down upon him before he can gain cover. Hawks and Fiskal Shrikes hunt him by day, and owls by night. Snakes also levy a heavy toll on his tribe.

The little Shrew is not altogether defenceless. He is provided with a gland which secretes a fluid giving off an unpleasant musky odour. When attacked by an enemy, the Shrew excretes some of this musky-smelling fluid, which often has the effect of causing his would-be slayer to leave him alone.

When in Natal, my domestic cats frequently brought dead Shrews into the dwelling, but they never ate them.

This musky secretion in the Shrew is not only a negative means of defence against certain other creatures which would otherwise devour them; but it is a means by which the sexes find each other, or by which a male tracks a rival who happens to intrude on his preserves. Shrews are often found in dwellings and outhouses, attracted by the cockroaches, crickets and other insects which are so commonly found in and about houses. When Shrews take up their abode in a house they should not be molested, for they are exceedingly useful to the housewife in her war against cockroaches, and

those troublesome pests the mice. In gardens they are also highly useful, for they devour vegetation-eating caterpillars, beetles, slugs and snails.

In Natal I surprised Shrews on several occasions during the daytime climbing up the stalks of wheat, grass, or other plants, in search of insects, or to get into the direct rays of the sun. During their progress they gripped the stem with their toes and wound the tail round it. Seizing one by the neck I endeavoured to remove it from a stem, but it clung so tightly with its teeth, limbs and tail that I could not remove it without employing such force as would have seriously injured it.

The cry of the Shrew is a shrill, sighing squeak.

THE MUSK SHREWS OF SOUTH AFRICA

THERE are a large number of species of Shrews in South Africa. Shrews are divided into two groups, on account of the front or incisor teeth being reddish in some, and white in others.

The Shrews with white teeth are known as Musk Shrews, because of a gland on either side of the body which secretes a strong, musky-smelling fluid. These Musk Shrews occur in Africa, Europe and Asia, but none exist in Britain.

In South Africa there are two races, which, in consequence of slight differences in their dentition,

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and of the hairs on the tail, have been separated into two genera, viz. *Crocidura* and *Myosorex*. The two genera may be separated by an examination of the tail. In the genus *Crocidura* the tail has a number of long white hairs, in addition to the coating of short bristles. Whereas in the genus *Myosorex* there are no long white hairs in the tail.

In a work of this nature it is unnecessary to review the various species or kinds of Shrews found in South Africa.

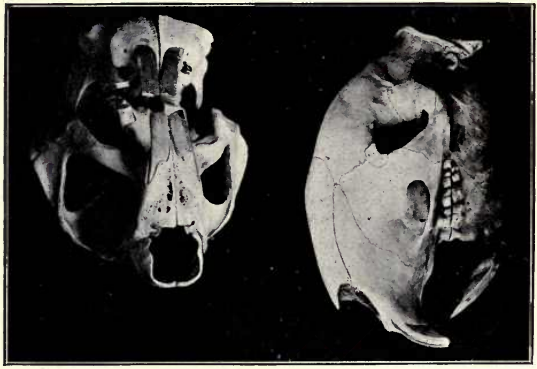
Shrews of one species or another occur in every part of the country. The habits of life of all the different kinds are practically alike. The Musk Shrews differ in size according to the species. They average from 2 to $3\frac{1}{4}$ inches, not including the tail, which is 1 to $2\frac{1}{2}$ inches. Shrews may be recognised in the following way:

(1) Body mouse-like, covered with soft fur; tail with a thick coating of bristles; snout elongated; sides of snout swollen by the roots of the whiskers, which are unusually numerous.

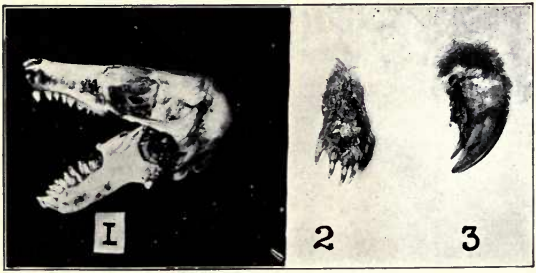
(2) Incisor or front teeth curved or sickle-shaped, with a cusp or projection at the base on the inner edge, giving the teeth the appearance of the claw of a cat. Lower front teeth projecting forwards, the points fitting in the inner concave side of the upper incisors or front teeth.

(3) Lower jaw has six teeth on each side.

The Golden Mole (*Amblysomus hottentotus*).



Dentition of a typical rodent animal (Porcupine).



(1) Dentition of an insectivorous animal (Golden Mole).
(2) Hind foot and (3) fore foot of a Golden Mole.

THE GOLDEN MOLE OF SOUTH AFRICA

Owing to the dearth of illustrated books of a popular nature on the animal life of South Africa and to the fact that Economic Natural History is not systematically taught in our schools, the genera public take little, if any, interest in the ways and habits of the denizens of veld, forest, mountain and stream; and mammals, birds and reptiles eminently useful to the human race are, in consequence, wantonly destroyed.

The average man does not use his reasoning faculties overmuch in the study of the animal life around him. He is, as a general rule, a most careless observer, and therefore forms hasty and erroneous conclusions. For instance, he observes one of the hawk tribe swoop upon a chicken and carry it off, or perchance a Secretary Bird is seen to kill a young hare, and ever after Hawks and Secretary Birds are shot at sight as vermin.

The little Mole or Kruipmolletje is another of our animal friends which is bitterly persecuted, owing to the popular but erroneous belief that it eats the root crops.

There are a good many species of Moles, and a

number of local races or sub-species in South Africa. They are all known as Golden Moles, because of the metallic sheen on the fur, which, in certain lights, appears golden in colour. The majority are coppery-red; one, which is known as Peter's Golden Mole, is almost black, with a greenish sheen.

The habits of all the species are more or less similar. They tunnel underground, and only appear on the surface at infrequent intervals. The young are born and reared in a nest—usually of soft grass—in one of the burrows. When the season for mating arrives, the rival male Moles fight terrific battles, and those unfitted to propagate their kind are either killed or forced to lead solitary lives. After the fight the victor frequently devours at least part of the body of his rival.

The Mole is one of the most energetic animal engineers known. Its excessive energy in tunnelling through the soil is prompted by its voracious appetite, which it is obliged to satisfy or perish. With its powerful digging claws it tears away the ground, and casts it up from time to time in the form of the well-known "hills."

Throughout the night the Mole toils on. It does not tunnel at random in its quest for food. It has a main run or tunnel in which it travels backwards and forwards, and out of the sides of which fresh tunnels are driven at intervals in search of food. When the food-supply is exhausted, the Mole extends its main tunnel, or else emerges to

the surface during the night and migrates to a locality more fertile in worms and grubs. By observing the work of the Mole for a few nights, the main burrow can be detected. When this is located and a special mole-trap is carefully set in it, the owner of the burrow usually falls a victim.

When the ancestors of Moles began to pursue their prey, and escape from their enemies by burrowing underground, their eyes became modified, and as these were of no practical utility to an animal living in almost perpetual darkness, they almost disappeared, and but the tiniest vestiges now remain. It is a law of the Creator that if an organ or any part of a living creature is not regularly exercised it, in course of time, becomes rudimentary, and eventually disappears. The human body itself is a museum of relics of organs, muscles, and nerves which ages ago were in the fullest vigour, but which to-day are in an atrophied condition. Eyes being of no value to the Mole in its quest for food, avoidance of enemies, or seeking a mate, its sense of smell has been developed to an unusual degree of excellence. So highly sensitive are its olfactory organs that the Mole in its burrow underground can detect the presence of an insect within a radius of a yard or more. This wonderfully acute sense of smell enables the Mole to dig a hole straight to its intended prey, instead of expending a vast amount of energy in tunnelling at random in the soil. When plants are growing in rows, it will

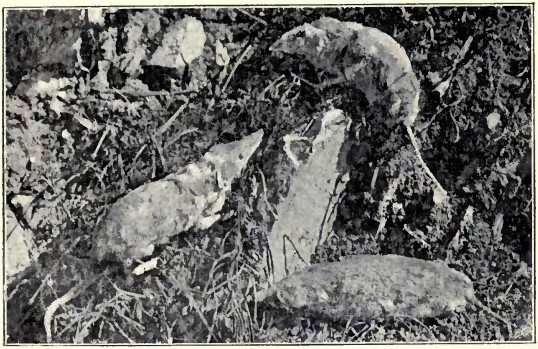
frequently be noticed that the soil along each line has been slightly elevated or disturbed. This is caused by a Mole, which tunnels its way along the rows, a couple of inches or so beneath the surface, in quest of the grubs and various larvæ which usually congregate about the roots of plants on which they feed. Occasionally the Mole, in its passage, disturbs the roots of some of the plants so seriously that they die, but this does not occur except with young, tender, and small-rooted kinds.

In a field which I examined at Walmer at intervals over a period of five years, I noticed that the Moles had tunnelled it so thoroughly that I estimated at least two tons of subsoil had been annually cast up on the surface. Therefore, it can clearly be realised what a great part the Mole takes in enriching the soil.

If the teeth of the Mole be examined it will be observed they are all specially adapted for eating insects and other small creatures. From the nature of its teeth the South African Golden Mole is classified in zoological science as an insectivorous animal of the order Insectivora, and of the family *Chrysochloridæ*.

I have kept Moles in captivity, and have never been able to induce them to eat potato tubers or any other kind of vegetable matter. I have also examined the stomachs of large numbers of Moles, and have not once found any vestige of vegetable substance therein. The contents of the stomachs

The Giant Golden Mole *(Chrysospalax trevelyani)*.



Musk Shrews *(Crocidura flavescens)* searching for insects.

The Cape Golden Mole shewing its picks and shovels (fore and hind feet).

consisted of beetles, worms, and the larvæ and eggs of a variety of insects and other creatures which prey upon the roots of plant life.

The Golden Mole prefers the cultivated grounds of the farmer to the hard veld, for the all-sufficient reason that among the crops are to be found insects and their larvæ in abundance. From all sides certain species of beetles, moths, etc., congregate and lay their eggs in the soil among the growing crops. These eggs hatch out into grubs, which devour the roots of the plants, including the potato tubers. When adult, the grub turns into what is called a chrysalis or pupa, and eventually leaves the ground as a winged insect. It is these grubs on which the little Mole wages incessant warfare. To make it of the utmost possible value to man, the Creator has endowed it with powerful digestive organs, and an appetite so keen that it is all night on the prowl for food.

It is alleged that earthworms do an immense amount of good to the soil by bringing up the deep subsoil and casting it upon the surface, after passing it through their bodies, and that the Mole destroys these worms. The earthworms which throw up hills are seldom found in cultivated lands. They prefer the undisturbed, uncultivated veld, and burrow deep down into the soil. The Mole subsists largely on wire-worms which feed upon the potato tubers. These so-called "wire-worms" are big grubs, and are the larvæ of beetles.

Moles invariably burrow from a couple of inches to half a foot beneath the ground, as they are well aware the insect life on which they subsist abounds near the surface. The beneficial earthworm when disturbed retires down to the bottom of its burrow; and if this worm constituted the Mole's chief food, it would also be found burrowing deep into the soil, and preferring uncultivated fields.

The various insect-eating birds of this country, which parents so foolishly allow their sons and native servants to destroy, are the natural enemies of armies of insects which are a pest to man. These birds wage warfare upon the insect hosts above and on the ground, while our little friend the Mole attacks them underground in the egg and grub stage of development. Here we have an instance of how wonderfully the Creator maintains the balance of Nature. Insects breed and multiply with remarkable rapidity, and it is necessary that they shall be encompassed by many enemies; therefore let Man pause before raising his hand against any living creature. Man should have a good and sufficient reason for all he does, and the lives of the creatures of mountain, veld, forest and stream should not be wilfully and wantonly taken merely to gratify a destructive instinct which has been handed down from our palæolithic ancestors, and which we should ere this have overcome.

In devouring insects we have seen the Mole is

of considerable value; but it has another use, and an important one. In its quest for insect food, the Mole tunnels the ground in all directions, loosening and throwing the valuable subsoil to the surface, thus enabling the sun, air and bacteria to operate upon it and change its nature. Again, by disturbing the ground and intersecting it with tunnels, the rain accumulates underground instead of running off the surface, as would otherwise be the case. Thus does the Mole increase the fertility of farm and veld.

The Mole has faults from the human point of view. All living creatures which are in the main beneficial to man do some harm on occasion, and the Mole is no exception. In its eagerness to capture and devour the hosts of noxious insects which mature underground, it sometimes disturbs seed-beds and the roots of tender plants, or perchance it will elect to throw up its hill on garden paths, or make shallow drives in the lawn in quest of worms. Farmers occasionally object to the Mole because the hills it throws up interferes with the reaping of a crop; but what little inconvenience is now and then experienced in this way is surely more than compensated for by the increased fertility of the soil due to the underground tunnelling and casting up of the rich subsoil.

We, as a race, are far too hasty in passing judgment on our animal friends because of such trivial sins, forgetting or allowing ourselves to be wilfully

blind to the overwhelming greater good which they are accomplishing.

The Golden Moles, which only inhabit South and East Africa, are so very different from the true Moles that they are placed in another family (*Chrysochloridæ*). In general appearance they are like European Moles, but when closely observed it will be noticed their bodies are shorter and thicker, with a blunter snout and deeper head. The true Moles (*Talpidæ*) of Europe, moreover, have short tails, but the Golden Moles of South Africa have no visible tail.

RODENTS:
ANIMALS THAT GNAW

THE Rodents are animals that gnaw, and in consequence we find they possess teeth eminently suited for that purpose.

A Rodent or gnawing animal can at once be recognised by its front or incisor teeth, and the absence of canine teeth. The incisors are large and curved. If the points are examined they will be found to be chisel-like, viz. bevelled off on the inner edge. The reason is that the outer face of the tooth is covered with hard enamel, while the rest of the tooth consists of soft ivory, consequently when used the soft inner portion wears away, leaving a sharp cutting edge of enamel. The idea of a carpenter's chisel originated from the gnawing teeth of Rodent animals. The thin layer of steel which constitutes the cutting edge of a chisel corresponds with the enamel of a Rodent's tooth, while the thicker portion of the chisel, which is designed to give support to the thin layer of hard steel, is similar to the ivory portion of a Rodent's incisor tooth.

These teeth, which are so perfectly adapted for gnawing, are remarkable in another way. They

grow continuously throughout life. This provision of Nature is essential to the life of a Rodent animal, for, owing to constant use in gnawing hard substances, such as wood, these teeth, which are for the most part composed of soft ivory, would soon wear down to the gums. If, however, an accident should happen to one of the lower front teeth, the corresponding upper one, meeting with no resistance, will continue to grow, and eventually be the cause of the animal dying a lingering death. Many such instances are on record. A live Ground Squirrel was sent to me in the last stages of starvation. On examination it was seen that one of the lower incisor teeth was missing, and the corresponding upper one had grown so long that the animal was unable to eat. In the Port Elizabeth Museum we have the skull of a Blesmol showing an upper incisor tooth which, owing to an injury to the corresponding lower incisor, had grown in a semicircle, and the point had imbedded itself firmly in the base of the animal's palate. It is more common for an upper or lower incisor to get broken, and before it can grow the proper length to come in contact with its counterpart in the opposite jaw, the other has grown unduly long and curved inwards, so that when the broken tooth grows, it fails to come in contact with the point of its fellow, and continues growing, with the result that the upper and lower incisor teeth grow abnormally long. We have such an example in the Port

Elizabeth Museum; the lower incisor had grown over the nostrils of the animal, and the corresponding upper one had curved round the outside of the chin. The animal was, nevertheless, in good condition when killed.

Rodent animals are found all over the world, and there are about 2000 kinds or species known. All forms of life, from the lowest kinds of vegetation up to and including Man, have checks placed upon the undue increase of their kind. Man, by reason of his rapidly evolving brain, has succeeded in overcoming and rising superior to a number of the forces which kept his primitive ancestors severely in check. He has been successful in domesticating and breeding many kinds of animals. These animals are now fulfilling the mission which previously fell to the lot of the Rodent tribes to perform, in helping to keep plant life in check. Rodents, therefore, with but few exceptions, are not now of much consequence in the economy of Nature. When they dwell in the countries populated by Man they invariably become a curse to him, by reason of their vegetation-devouring propensities. They levy a heavy toll on his crops, and attack his pasture lands and plantations.

It is consequently highly to Man's advantage to know how to recognise friend from foe in the lower animal world, and at the same time learn not to be too hasty in his conclusions, for many animals which are in the main beneficial and helpful

do harm at times, but not sufficiently so to justify us in destroying them. Many species of Rodent or gnawing animals supplement their vegetable diet with insect and other forms of animal food.

In captivity most of the South African species of Rodent animals eat flesh food freely. Some species, such as the Dormouse, kill and devour one another, and so, too, do the rats and mice. Other species, such as rabbits, frequently eat their young when their domestic arrangements are interfered with.

There can be no reason to doubt that the destruction of Rodent animals would alter the balance of Nature largely in favour of man. The annihilation of rats and mice, for instance, would add considerably to man's physical welfare, both in the prevention of diseases, and the saving of his foodstuffs and other commodities, which rats and mice so largely damage and destroy. Rodent animals, as a general rule, breed at frequent intervals, and a large percentage of them produce several progeny at a birth. Those species which fall an easy prey to their enemies are the most prolific. This is a wise provision of Nature, otherwise their species would become extinct. The Rodent tribes of animals are kept in check by carnivorous animals, birds of prey and snakes.

THE SQUIRRELS

Squirrels belong to the Rodent or gnawing tribe of animals. They are almost world-wide in their distribution, and the number of species is very great. A few kinds are terrestrial and live in burrows in the ground, but the vast majority are tree-dwellers. Some kinds progress from branch to branch, and tree to tree, by means of a parachute-like membrane attached to the sides of the body and legs. These are known as Flying Squirrels.

Squirrels feed on nuts, fruits, berries, bark, tender shoots and roots; supplemented when occasion offers by birds' eggs and nestling birds.

In South Africa there are two widely different kinds of Squirrels. One lives in little family parties in burrows out on the treeless Karoo; the other kind is arboreal, inhabiting the forest districts of the country.

There are six species of Squirrels, and three sub-species recorded from South Africa south of the Zambesi and Cunene Rivers. The best known are the following:

THE GREY-FOOTED SQUIRREL

(*Paraxerus cepapi*)

The Grey-footed Squirrel is an inhabitant of the bushlands of the northern provinces of South Africa.

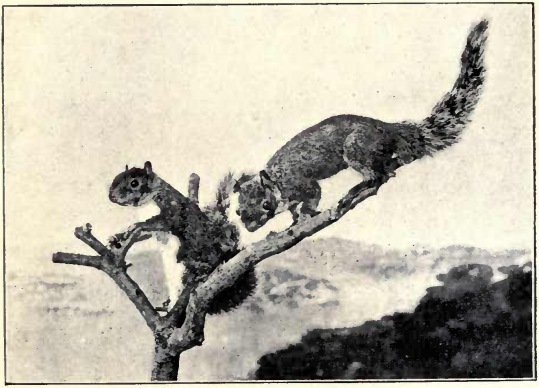
It occurs in the Transvaal, Southern Rhodesia, and in the neighbourhood of the Zambesi River. From these regions it extends northwards to Nyassaland. It is common in the tree-covered parts of Ngamiland.

Although the Grey-footed Squirrel spends most of its time aloft amongst the tree branches, yet it makes frequent excursions along the ground in search of edible bulbs, roots, berries and fruits. When surprised on the ground it instantly races for the nearest tree, up which it scrambles with great rapidity, although the tree-trunk may be quite perpendicular. When aloft in a tree it hides itself in a fork, lies flat along a thick branch, or springs rapidly to the top and conceals itself amongst the foliage, or retreats along the tree-tops.

Holes in the branches and trunks of old trees are its favourite lairs. These are improved or enlarged to suit its requirements. In these retreats it rears its young family, and stores up provisions in the form of berries and seeds against times of scarcity, and for cold, rainy days when it does not care to venture from its cosy nest. This Squirrel is called Idsindi by the Mashonas, who eagerly hunt it for food. It seems to have a great liking for the Mopani tree, for it is invariably seen in trees of this species.

We obtained one of these Squirrels from Rhodesia, and kept it alive for a considerable time in the Port Elizabeth Museum. It was exceedingly active in its movements, and ate any kind of vegetable food,

The Grey-footed Squirrel *(Parasciurus cepapi)* of the bushlands of the northern portions of South Africa.



The Grey Squirrel (*Sciurus carolinensis*) was introduced into Cape Town from North America and now threatens to become a serious pest to the country. A price has been set upon its head.

fruit or nuts. It grew very fond of cooked meat, and even ate it raw. There was a small cavity in the tree-trunk in its cage, and when it had more food than it could eat at the time, it stored the remainder in this cavity and ate it as required. In their native haunts these Squirrels are both diurnal and nocturnal, or, in other words, they are active both day and night.

The Grey-footed Squirrel may be identified as follows :

(1) Fur soft, short and thick, of a speckled yellowish-grey with a blackish tinge, owing to the majority of the hairs of the back being ringed subterminally with black. Under parts dingy white; body unstriped; head the same colour as the back; whiskers black; ears covered sparingly with hairs, and oval in shape. The legs, which are paler than the back, and grey in colour, are armed with short curved claws.

(2) Body 8½ inches, not including the tail, which is about 8 inches long to the end of the terminal hairs. The tail is bushy and the hairs are pale yellow; each hair has two rings of black, giving the entire tail a dark hue.

There is a sub-species or local race of the Grey-footed Squirrel named *Paraxerus cepapi sindi*.

THE RED-HEADED SQUIRREL

(*Paraxerus palliatus typicus*)

Pocoluti of the Zulus; Inchindau ebomvu of Swazis.

The Red-headed Squirrel is an inhabitant of the forest belts on the eastern side of Africa, from the northern borders of Natal, through Zululand, Mozambique, Nyassaland to British East Africa. The habits of these Squirrels are very much the same as those of the preceding species.

According to Mr. Francis, it is common in the neighbourhood of Inhambane, and is known to the natives there as the T'shindi. He says it may be seen amongst the trees in the mornings, and that it has a peculiar habit of jerking its tail upwards and forwards. Its description, according to W. L. Sclater, is as follows:

"Head speckled rufous and black; below, including the cheeks, chin, inside and lower halves of the legs, bright rufous, the hairs being the same colour throughout. General colour of upper parts of the body and outside of limbs speckled yellow and black, the hairs black at the base, and subterminally, with intermediate reddish-yellow bands, and paler yellow tips. Tail dark rufous, with long hairs which are very pale at the base. Each hair has two black rings, and the terminal half is dark rufous. Whiskers black; eyes dark brown. Incisor teeth smooth and dark orange."

The Red-headed Squirrel is about the same size as the Grey-footed species.

There are two sub-species, which are named :
Paraxerus palliatus ornatus.
,, ,, *swynnertoni.*

THE WESTERN STRIPED SQUIRREL

(*Funisciurus congicus*)

The only portion of South Africa where this species of Squirrel has been recorded is from Ovampoland in South-West Africa. From this locality it extends northwards through Angola to the Congo regions. It may therefore be regarded as an inhabitant of the western side of Southern Africa ; the Red-headed Squirrel taking its place on the eastern side.

The western Striped Squirrel can be recognised by the presence of a narrow, pale yellow stripe running along each side of the body from the shoulder to the region of the tail. Below this yellowish stripe is a similar dark one. The prevailing colour of the back is yellowish-brown, which is brighter on the shoulders. A considerable number of the hairs on the back are tipped with black. The eye has an incomplete white ring around it ; whiskers black ; tail bushy, bright yellow in colour, each hair having a subterminal dull yellow ring. The toes are covered with long hair which nearly conceals the claws ; limbs paler than the back. Head and

body averages 8 inches in length; tail to the end of the terminal hairs, $6\frac{1}{4}$ inches.

THE GREY SQUIRREL

(*Sciurus carolinensis*)

Although not native to South Africa, the Grey Squirrel is now a familiar figure in and about Cape Town. It was originally introduced by the late Mr. Cecil John Rhodes, who released a few pairs on his estate at Groot Schuur. These Squirrels throve so well in their new environment that they have spread all over the suburbs of Cape Town, and are now a source of much vexation to fruit-growers. Unless destroyed they will spread to other parts of South Africa, and become a serious pest. They are now on the vermin list, and threepence per head bounty is paid by the Cape Provincial Government.

The Grey Squirrel is an inhabitant of North America, from the northern borders of the United States, southwards through Mexico to Guatemala.

It is an extremely lively little creature. It buries its stores of food in various parts of the forests just beneath the ground, and in cavities in tree-trunks, if such should be available.

When surprised upon the ground this nimble little fellow makes for the nearest tree, and, with the aid of his strong, curved claws, is aloft amongst

the branches in a few moments. These Squirrels make nests of twigs and leaves in the forks of the higher branches of the large trees.

There are a number of local races of Grey Squirrels, and each varies more or less from the other in colour, but the description of those in and about Cape Town is as follows:

Body larger than that of the European Squirrel; grey above and white on the under parts, the line of demarcation being very pronounced; tail long and bushy, grey in colour, mixed with white and rufous; head and limbs tinged with rufous; each eye is encircled by a whitish ring; the ears are rather small, and there are no ear tufts.

The Grey Squirrel shows little fear of man and exposes itself freely. It is alert in the trees or on the ground from early morning to sunset, and on moonlight nights it may be seen and heard abroad, for it is a noisy little animal, chattering and muttering continuously. It excavates burrows beneath old fallen logs, piles of brushwood or timber, makes its home in a burrow in the earth, or digs the decayed wood out of old tree-trunks and makes its lair therein. The Grey Squirrel is one of the hardiest of the family. It thrives equally well in cold or warm climates. In regions in North America where the winters are almost Arctic this little Squirrel may be seen abroad on the snow as merry as a cricket. The Grey Squirrel is very fond of fruit. It also does a great deal of harm in devouring

the eggs and young of birds of great economic value.

THE CAPE GROUND SQUIRREL

(*Geosciurus capensis*)

This wonderfully interesting little animal is an inhabitant of what is known as the Karoo-veld, which are vast arid plains in the interior parts of South Africa. For hundreds of miles on every side the country is dotted with mountain ridges, and isolated hills surmounted with a cap of bare rock. These separate hills are known as Kops or heads, and the smaller ones as Kopjes or little heads. They frequently stand alone or in groups out on the great plains. On examination, these ridges, kops and kopjes unfold to us the geological history of South Africa. The scantiest of vegetation covers them. This is as we should expect, for torrential rains in the far-distant past have so thoroughly washed their surfaces, and the disintegrating forces of air, water and electricity have so effectually eaten into them, that they, to-day, present to the eye a vast mass of scattered, broken and waterworn boulders, pebbles and sand, amongst which the hardiest forms of vegetation struggle for existence. In fact, they are but skeletons of their former selves, for their substance has long since been scattered over the lowlands, and slowly

but surely helped to silt up the lakes and rivers which in former ages abounded in South Africa. Thus were the great Karoo and grass-velds of this country formed.

When Nature's giant forces were thus at work, the country was covered with forests of trees. In these virgin forests, armies of Squirrels lived in comparative security in their nests in the hollows of the branches and trunks of the veteran forest giants. Food there was in abundance. The trees, fed by abundant rains, throve apace and produced their annual harvests of fruits and berries in profusion; and on these the Squirrels feasted and laid by ample stores for the winter season. But it was so ordained that this condition of things was not to persist for ever. This Squirrel paradise was doomed. The end came not suddenly. Slowly but steadily from generation to generation the rainfall lessened. Then came the struggle for existence in the vegetable kingdom. The less hardy trees and plants died of thirst. As the rainfall lessened still more, hosts of species of plants perished, until, one by one, the great forest trees waned in vitality and died.

This struggle for the survival of the fittest was not going on in the vegetable kingdom only. The insects, reptiles, birds and mammals inhabiting those forest and bush-covered lands were also struggling for existence; and in the fight new forms or species evolved. In many parts the rainfall eventually

grew so scanty that the only kinds of vegetable life which succeeded in surviving were the low, stunted, deep-rooted bushes and bulbous plants with which the Karoo-veld of to-day is covered.

Now, as the forest trees perished and were slowly but surely being replaced by these hardy, drought-resisting forms of life, what became of the Squirrels which inhabited those trees? Did they perish and their kind vanish from the face of the earth? No! As food aloft in the trees became increasingly scanty, they resorted with ever-increasing frequency to the ground in search of food. Finding succulent roots and bulbs underground, they did what they had seldom done before; they used their claws for digging in the soil. No sooner does a creature begin to make a new use of any part of its anatomy, than some intelligent, mysterious Force comes into operation, and the part is changed, and adapted to the purpose desired. So the curved claws of the Squirrel, which were of such splendid service to it in climbing trees, leaping, clinging, and in gathering fruits, berries and nuts, became adapted for digging in the ground. Finding themselves at the mercy of the hosts of carnivorous animals and birds of prey when on the ground, and not having a tree into which to take refuge, they excavated burrows in the soil and formed homes underground, into which they sought refuge from these enemies.

So, like the Klip Dassie (*Procavia capensis*), this Squirrel was faced with annihilation, or the adop-

The Red-headed Squirrel (*Parasciurus palliatus*) inhabits the bushveld and forests from the northern borders of Natal to East Africa.

The Ground Squirrel (*Geosciurus capensis*) lives in families in burrows in the ground out on the lonely dry karoo.

tion of an entirely different mode of existence to which it was accustomed.

The Dassie abandoned its arboreal life, and sought shelter in the cracks and crannies of the rocky hills and kloofs; and it is known, in consequence, to-day as the Klip or Rock Dassie.

The Squirrel, finding the rock crevices already occupied, or being unable to successfully contend against the Klip Dassie for the possession of these desirable retreats, annexed the great stretches of lands known as the Karoo.

Therefore we find the Ground Squirrel inhabiting all the drier central portions of the Cape Province, the Kalahari, Bechuanaland, Rhodesia and Damaraland. It seems to prefer the portions of the country where the rainfall is scanty, for it does not occur in the territories towards the east. This evidently is owing to the fact that its burrows are on the plains, and these would be rendered uninhabitable if they were in the parts of the country where the rainfall is heavy and frequent. The Ground Squirrel lives entirely upon the ground, and even if trees are in its vicinity it does not attempt to climb them. This tree-climbing instinct, so strong in its remote ancestors, seems to be entirely lost. In captivity, however, if tree-trunks or branches be placed in the cage, it does not hesitate to leap upon them and run about on the branches, but it does not attempt to climb any that are perpendicular.

The Ground Squirrel lives in communities of

half-a-dozen to a dozen and more individuals. It excavates burrows out on the open Karoo, and in passing through the country by train, hundreds of groups of these curious little creatures may be seen sitting up on their haunches staring curiously at the train as it rushes past. On the slightest semblance of danger, the whole community of Squirrels race off chattering to their burrows, into which they hastily disappear. However, they soon become confident when not interfered with, and are so used to the train rattling past their burrows, that they usually make no move to seek shelter, but merely stare at it as it rushes past within a dozen yards of them. In riding or driving over the much-frequented routes across the Karoo-veld, the Ground Squirrels show little fear of man, and allow him to approach within a score of paces. They, however, are careful to be within a yard or so of their burrows, for, if cut off from their underground retreats, these Squirrels can easily be captured even by a man on foot after a short run, as they are very poor runners. For this reason they never venture far from their holes. The young are born and reared in a cosy nest at the bottom of the burrow.

It is a comparatively easy matter to dig Ground Squirrels from their underground retreats and capture them alive. They are frequently kept in captivity by colonists, and make gentle and interesting pets. If placed in warm, roomy cages and well

fed, they may be kept in health and strength for years If captured when young they may be so thoroughly tamed that if released they remain in and about the premises. To keep these animals in captivity, a good way is to enclose several square yards of ground, and sink wire netting or galvanised iron round the boundaries to a depth of two or more feet, to prevent them burrowing out and escaping. The safest plan is to pave or cement the floor of the enclosure, leaving a portion in the centre for them to form burrows in. The floor should slope outward from the centre to prevent the burrows getting flooded. In captivity the Ground Squirrel may be fed on any kind of edible vegetable substance, including bread, fruit, nuts and even meat. In the wild state their diet consists of the roots of the stunted Karoo bushes, and the bulbous plants which grow in such abundance on the Karoo-veld. These it digs out with its strong front claws. They furnish the little creature with both food and drink, for out upon the dry wastes which are its home there is no water to be had, except when an occasional shower of rain falls. Even then the water does not lie on the surface, for the thirsty land rapidly sucks it up and supplies it to the parched vegetation. There are a considerable number of creatures which never drink, the moisture in the food they subsist upon being ample for their bodily needs.

When the naturalist travels in South Africa and

comes in frequent contact with the general public, he soon becomes convinced that accurate Natural History knowledge is at an exceedingly low ebb. Take one instance out of many scores of typical cases. The Ground Squirrel is one of the commonest species of animals in the inland parts of South Africa; and its habit of disporting itself during the daytime out on the open Karoo-veld makes it a familiar object to every resident of those parts. Yet I doubt if there could be found even one individual in a thousand who could correctly name it. Travelling through the Midlands on a lecture tour, I asked over a hundred different individuals in various parts of the country, viz. farmers, villagers and townspeople, including school-teachers and even College Professors, if they "knew the little yellowish-brown animal with a white-streaked bushy tail and body, which lives in families in burrows on the Karoo-veld, and which can be seen by any one along the lines of railway." Some had frequently seen it, but did not know its name. The majority, however, instantly answered, "Yes, I know it well; it is a Meercat."

In the Port Elizabeth Museum we had several on exhibition alive, and during the Agricultural Show week great crowds of farmers thronged the Museum. Removing the label bearing the name of the Squirrels, I asked an assistant to stand near their cage at intervals during the day. In every instance the animals were called Meercats. There is, how-

ever, some excuse for confusing the Meercat with the Ground Squirrel, for in habits the two are more or less similar. There is no relationship between the Ground Squirrel and the Meercat. The former is a rodent or gnawing animal, and the latter belongs to the carnivorous tribe. Rodent animals can at once be identified from carnivorous animals by the presence of sharp, chisel-like front or incisor teeth, and the absence of canines. There is always a pronounced gap between the front teeth and the back ones. The carnivora have canine teeth, and there is no gap between the front and back teeth. The molar teeth, moreover, of the latter have pointed tops or cusps. The chief enemies of the Ground Squirrel are the Muishonds, Mungooses and birds of prey. However, the latter are not feared overmuch by the Ground Squirrel, for it seldom ventures far from its burrow, and the large hawks and the eagles can be clearly seen when approaching, owing to the lack of cover. Sometimes an eagle will swoop swiftly over a neighbouring ridge and drop suddenly in the midst of a family of Squirrels sunning themselves, or busy digging up bulbs.

The Ground Squirrel is defenceless against the attacks of the Mungoose and Muishond, for these animals follow it down to its innermost retreats underground.

When attacked it bites desperately with its sharp, chisel-like front teeth, but is no match for these

fierce little carnivorous creatures which hunt it down so relentlessly.

Although the Ground Squirrel is of no economic value to man, yet it does him no harm, for its home is far out on the Karoo, and the few bulbous roots it devours are of little or no consequence. The vegetable kingdom is compensated by the soil being loosened and thus rendered more fertile.

Indeed, the destruction of these unique little creatures should be distinctly discouraged, if not forbidden by law, for the reason that they constitute one of the chief attractions of the Karoo-veld to the tourist journeying over these vast plains, which during the greater part of each year look dry and arid, and the only animal life seen from the windows of the train for hundreds of miles are families of these Ground Squirrels sitting upright on their haunches, or running off with their long, hairy tails streaming behind. Sitting hour after hour looking out from the train upon the unchanging Karoo-veld, the sight of these lively little creatures at intervals along the route is distinctly enjoyable, and in addition furnish a lesson in the Natural History of the country. As an article of food the Ground Squirrel is not sought after by Europeans, but in the past it afforded a welcome addition to the fare of the pygmy Bushman, who, with his stone tools and weighted digging-stick, was not long in getting it out of its burrow.

This genus of Squirrel occurs in South Africa

only. Unlike its cousins the Tree Squirrels of various countries, it does not lay up a store of food for winter use, for the reason that such provision is not necessary, as the roots on which it feeds are available at all times of the year, and the cold in winter is not excessive. During the chills of night it lies snugly in its nest at the bottom of its burrow; and at sunrise it emerges and warms itself in the sun's rays, for out upon the Karoo-veld it is seldom that the sun is obscured by rain-clouds, either in winter or summer.

I kept several of these Squirrels alive at the Port Elizabeth Museum, and being anxious to keep some live Tortoises (*Testudo angulata*), and not having sufficient accommodation, I put them into the cage with the Ground Squirrels. I was astonished the following morning to find two of the Tortoises dead, and portions of their bodies eaten, although the shells were intact. By means of their chisel-like incisor teeth and strong front claws, the Squirrels had actually succeeded in doing what no dog or cat could do, viz. kill an adult Tortoise and eat out its flesh from the small openings where it protrudes its head and legs, between the carapace and bony abdominal plate. From this experience, I have no doubt in the wild condition the Ground Squirrel supplements its diet on occasions with the flesh of Tortoises. Our captive Ground Squirrels consume both raw and cooked meat readily.

THE CAPE DORMOUSE

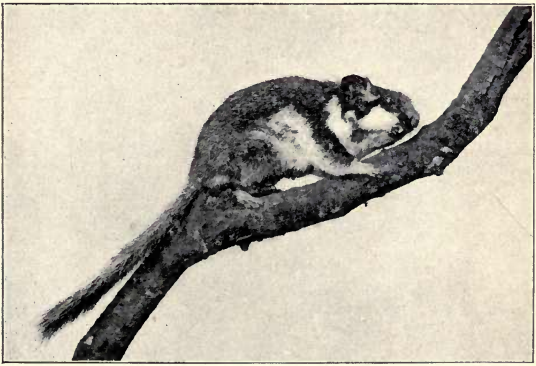
(*Graphiurus murinus*)

The graceful little creatures known as Dormice inhabit Europe, Asia and Africa. In South Africa there are several kinds or species. The most familiar, however, are the Cape Dormouse (*Graphiurus murinus*) and the Grey Dormouse (*Graphiurus ocularis*).

The Cape Dormouse is widely spread, for it is found all over South Africa in the wooded districts; and extends northwards as far as Central Africa. In South Africa it is commonest in the eastern portion of the country, for the reason that most of the forest belts are in that direction. The Cape Dormouse is by nature arboreal—that is, it inhabits trees. However, it is now often seen in old stone walls, and in the thatch of Kafir huts and farm-dwellings.

It is a sociable little creature, and when not interfered with, will allow itself to be approached to within a few feet. Its favourite lurking places are holes in the trunks and branches of trees. In these recesses it builds a nest of fine grass, leaves and lichen, in the centre of which a pair of Dormice sleep. In this nest the young are born and reared. Four or

The Cape Dormouse (*Graphiurus murinus*) often makes its home in the hives of bees.



The Large Grey Dormouse (*Graphiurus ocularis*) is a typical South African species.

five is the average. At birth they are blind and hairless. Sometimes the nests are built in the thatch of old buildings; crevices in stone walls; in holes in sod fences; among the tangled roots of a tree on a sloping bank, and even in bee-hives. Mr. Loton Tipper, a resident of Zwartkops, near Port Elizabeth, was considerably astonished one day on lifting the lid of a bee-hive to inspect the frames, to find a pair of Cape Dormice in the top section of the hive. They had constructed a nest of moss, lichen and leaves, and in the centre of this, five blind and hairless young ones were found. The nest, with the parents and young, were handed over to me and placed in a dark cage. The assistant omitted to feed them one week-end, and, on discovering the fact the following Monday, I looked into the nest and found the little ones had vanished —the parents had devoured them. This is a common habit of many species of rodents. Sometimes the young are eaten because the nest is disturbed; but more frequently this happens when sufficient food is not obtainable by the parents. The young referred to were born in the month of December, and since then my Taxidermist has discovered unborn young in several specimens which he dissected about this time of year. It is therefore apparent that the chief breeding time of the Cape Dormouse is during midsummer. The food of the Dormouse is varied. Wild fruits, berries, seeds and buds form a portion of its diet. However, it

devours considerable numbers of caterpillars, beetles, and a host of other small creatures.

I have been informed by bee-keepers that it is not very uncommon to find a pair of Dormice in a nest in a bee-hive if the aperture should be large enough to allow their entrance. They do not seem to molest the bees in any way, nor do the latter make any attempts to drive them out. This is partly owing to the fact that they lie asleep in their cosy nest during the daytime when the bees are active, and only issue forth by night. The Dormice, probably, nibble a little of the honeycomb when opportunity offers. They resort to bee-hives on account of the warmth therein, and because such retreats afford security against their many enemies. However, in the modern bee-hives the entrance hole is not sufficiently large to admit a Dormouse.

I have now and then watched Dormice about sundown emerge from some snug retreat and, approaching a bee-hive, search out and eat the dead and dying bees which had been cast from the hive during the day. These Dormice do little real direct harm to man. True, they may nibble some of his fruit and grain occasionally, and eat a little honey, but this is compensated for a thousand-fold by the great number of insect pests they devour. They not only eat the mature insects, but they seek out the caterpillars which often play such havoc with vegetation; and should any insect, its larvæ or eggs be hidden beneath the bark, or in cocoons, it tears

them forth with its sharp incisor teeth and greedily eats them up. In captivity the Dormouse prefers such food to any kind of fruit, nuts or grains. The Dormouse possesses one very bad trait of character, for if it should happen on the nest of a bird, it eats the eggs and young. However, it is only the eggs and young of a few of the small birds which build their nests in the dense thickets of native bush which are preyed upon. The larger birds can always hold their own against the Dormouse.

One dull cloudy day, hearing a great din in a tree, I crept forward and unobserved saw a pair of Fiskal Shrikes (*Lanius collaris*), which juveniles term "Jack Hangers," angrily scolding two Dormice which evidently had evil designs on their nest, which I subsequently ascertained contained three young birds. The birds were the parents of those plump and toothsome-looking youngsters. Anyway, both parents had, doubtless, arrived in time to save their children. The Dormice were at bay, and afraid to retreat. However, their bold aspect was the courage of despair, for they well knew that they were in fearful peril. As I watched, one of the birds made a dash. There was a short scuffle, and a Dormouse dangled limp from the Shrike's strong beak. The other Dormouse fled, but was overtaken and similarly slain by the other parent bird. Presently the Shrikes hopped along to their nest and, dismembering the bodies of the Dormice, dropped them bit by bit into the gaping mouths of their babies.

Birds are very loyal to each other. I have frequently seen them come to one another's aid in order to beat off a common enemy.

On several occasions I have observed half-a-dozen to a dozen and more small birds collected together, and in the act of driving a Dormouse from the vicinity of a nest of one of their species.

The parent birds of the smaller species usually, on discovering an enemy in dangerous proximity to their nest, set up a shrill chattering, which attracts most of the birds of the neighbourhood. These join in with the others and mob the intruder.

Dormice in South Africa, like their European and Asiatic cousins, hibernate during the winter months. In summer food is plentiful, and the Dormouse waxes fat. On the advent of autumn it lays up a store of nuts, berries and other edibles in its lair, and creeping into the interior of its cosy nest it becomes torpid. The vital functions at this time are considerably lowered, and consequently little food-material is necessary. The animal, lying torpid, wastes no muscle-tissue, therefore the fat which has accumulated during the summer-time is all that is necessary to supply the fuel to maintain sufficient bodily heat to keep life's flame burning. If the day should happen to be warm, the Dormouse wakes and nibbles a little of its store of food.

At the old Port Elizabeth Museum we kept several Cape Dormice, and during the summer-time they were exceedingly bright and active towards evening

and at night, and ate anything and everything of an edible nature, whether vegetable, fruit, nut or meat. They, however, preferred meat, and if a variety of foods were placed in the cage, they always selected and ate the flesh food first. On the approach of the cold season these Dormice gradually became less energetic, and one day we found them all in a state of lethargy. They were incapable of walking or standing, and on being handled, moved their heads and legs in a sleepy kind of way; and when put back into the nest they wriggled for a moment or two and then lay still. The temperature of their bodies was at this time much lower than during their periods of activity. When the cage was placed out in the sunshine, they revived and regained all their summer vim and energy. But towards sundown, when the air once again became chilly, they crept into their nests and became torpid. It was interesting to observe how rapidly their bodies responded to a change of temperature of the air. On several occasions I purposely warmed these lethargic Dormice, and within half-an-hour they were as lively as they ever had been during the summer season. Placing them suddenly in a cold cage indoors, their activity steadily diminished, and in fifteen or twenty minutes they were sluggishly and feebly crawling into their nests.

In the wild state Dormice are invariably in pairs, and it is seldom that more than a couple are seen

in close proximity, unless it be the parents and a young family which have just emerged from the nest. When the young are able to fend for themselves, they go off and take up their abode at a distance. When two males meet, they fight with such determination that one or the other is usually killed, and the victor dines off the body of the victim, evidently thinking it to be wrong to waste good meat.

On one occasion I placed seven Dormice together, after I had noticed they were about to hibernate, thinking that at this season they would not interfere with each other. They all sluggishly crawled into the cosy nest which I placed in the cage, and went to sleep. At intervals for a couple of weeks I peeped in at them to ascertain if they were all right. There they lay, all happily dozing. When taken from the nest and laid in the palm of the hand, they wriggled uneasily, but made no attempt to stand, crawl, or even to open their eyes. If a leg was pulled out at full stretch it would be drawn in again, but otherwise these Dormice seemed incapable of movement. However, thinking it inadvisable to disturb them any more, I caused a vessel of water and a dish of assorted grains and nuts to be placed in the cage. At intervals on unusually warm days, I noticed a Dormouse sitting cleaning itself with its front paws and tongue, or eating some of the food provided. It only appeared at short intervals during the warmest part of the

day. It occurred to me one day that it was strange only one Dormouse at a time should show itself. So, carefully lifting out the nest, I examined it, and, to my astonishment, it only contained one Dormouse. This little fellow had evidently eaten up all his mates. Evidences of all the rest were there in the shape of gnawed portions of skulls, bones, toes and hair. This, truly, was a case of the survival of the fittest.

The Dormouse has many natural enemies. The bird known as the " Jack Hanger," or Fiskal Shrike, already referred to, is one of its enemies, for this bird will boldly attack and kill the Dormouse whenever an opportunity occurs. On many occasions I have happened on a larder of a pair of these Shrikes, and found the dismembered remains of Dormice impaled on Mimosa tree thorns, or on the barbs of wire fences. It is a habit with these birds to store up provender for rainy days, for at such times insects are scarce.

The various species of bush-frequenting Hawks and Owls are ever on the alert to pounce upon an unwary Dormouse out on the prowl at sundown for food. Rats and snakes also attack and devour these mice and their young. Although in the shady, quiet retreats of the forests or coppices, the Dormice may be seen at all times of the day, yet they are usually most active after sundown. There are good reasons for this. Firstly, their dreaded enemies, the Bush Hawks—notably, the little Sparrow Hawk

(*Accipiter minullus*)—and tree snakes are on the alert; and, secondly, the insects on which they largely feed emerge in great numbers about this time of the evening. Their general habit is to sleep during the daytime, and emerge about sundown and remain active throughout the night, unless the weather is inclement and cold.

When feeding, Dormice, like the Squirrels, usually take the food if not too bulky, in their forepaws, and sit upon their haunches when devouring it. Dormice belong to the rodent or gnawing group of animals, which include the squirrels, rabbits, rats, beavers, porcupines, etc.

The Cape Dormouse is mouse-grey above, and dull white on the under parts, including the cheeks, chin, and insides of the limbs; sometimes the fur on the cheeks, chin and breast is slightly tinged with rusty red. Eyes are large and prominent. Head and body averages 4 inches. The tail is slightly shorter than the head and body, and is covered with long hairs, giving it a bushy appearance. The tail tip is not white, as is the case with some of the other species.

A local race occurs in the northern part of the Transvaal, and is known as *Graphiurus murinus tzaneenensis*. The only difference, however, is that the skull is slightly smaller, and the tail more slender than in the typical form.

THE GREY DORMOUSE

(*Graphiurus ocularis*)

The Grey Dormouse is so called because of the ashy-grey colour of its fur. It can be distinguished from the Cape Dormouse by its larger size, colour of fur, and the black-and-white markings which are present on its head. On the snout and chin there is a reddish tinge. It is the largest of the South African Dormice, 6½ inches in length from nose to root of tail. The tail is bushy and long, being about two-thirds the length of the body. The Grey Dormice are widely distributed in the Cape Province, both to the west and east, and occur in the Transvaal, South-West Africa, and in many other localities where the environment is suitable. The natural home of this Dormouse is in forest trees, the holes in old rotten branches and tree-trunks of which afford shelter from its enemies, the birds of prey. Although it may hide itself where it will, the Boomslang, or Tree Snake, seeks it out and devours both it and its young. If there are stone walls in the vicinity of its bushy home, the Dormouse often resorts to these and takes up its abode in the crevices. It can frequently be seen running about the old stone walls of cattle and sheep kraals, where it picks up a living by devouring the beetles and other creatures, such as the larvæ of flies which feed on and pupate in the

dung. It also devours the eggs and young of snakes and lizards which are usually plentiful in old stone fences. Sometimes it takes up its quarters in the thatch, or crevices in the walls of farmhouses, and, if not molested, soon becomes quite tame. It is a beautiful little animal, and is seldom interfered with by colonists. In fact, it is about the last thing a farmer or his children would think of killing, for its appearance is so attractive, and its movements so silent and graceful, that they all learn to love the little creature.

We have frequently kept these Dormice in captivity at the Port Elizabeth Museum, and have found that their habits and ways are similar to those of the Cape Dormice. They preferred meat to any other form of food, and when it was withheld for a couple of weeks and then fed to them, they ate it greedily. Their habit of hibernating during the winter, and waking up to feed on warm days, were similar to these habits in the Cape Dormice. Like the other species, they reacted rapidly to a change of temperature, for, when torpid, if suddenly placed in a warm chamber, or out in the sunshine, they quickly became active and alert.

They are cannibals, for, if several be placed together in the same cage, the stronger will devour the weaker ones. When one succeeds in killing another, and providing it is not too severely wounded, it always feeds upon the body of its victim.

In captivity, if they are not fed liberally and kept cosy, dry and warm, these Dormice soon die. Unless thoroughly tamed, they always attempt to bite the fingers if lifted or otherwise handled.

Beyond feeding occasionally on grain and fruits, the Grey Dormouse does little direct harm to man. It, however, does him some indirect harm, for, if it should come across a bird's nest containing eggs or young, it will devour them; and as insectivorous birds are of the greatest possible economic value to the country, it is not at all desirable that they should be destroyed. However, the number accounted for by the Dormice is not great, and these little animals compensate man by being energetic insect-destroyers themselves. They may, therefore, be regarded as one of the lesser enemies of insectivorous bird life; and from an economic standpoint they are useful to man. Of course, as with everything, circumstances alter cases, for if a Dormouse becomes a nuisance by reason of having developed a liking for the young of favourite birds in a man's garden, or gnaws its way into his bee-hives, then he has every right to destroy it. But, because under certain circumstances a few individuals of a species of bird or animal do damage, it does not follow that man is acting wisely in declaring war against the whole of the species, as he so frequently does. Man does not seem to reason overmuch on these matters. He observes hastily and inaccurately, and in conse-

quence usually acts unwisely, for in the case of the creatures of veld, forest and mountain, a little knowledge is a dangerous thing. Man, by his unreasoning and wanton destruction of the native birds, animals and reptiles of the country, is committing a crime against those of his kind who come after him, as well as injuring himself and his neighbours. It would be well for him and the State if he put a curb on his destructive instincts, and allowed himself to be guided by an educated intellect in all he does.

The lives of the lower animals are held far too lightly by the majority of people. We expect to find brutal and ignorant people wantonly and indiscriminately destroying the animal life of the country in which they dwell; but we certainly do not expect educated folk to do likewise. It is high time the people of South Africa woke up to the fact that a very large percentage—in fact, the majority—of the species of the lower animal and bird life of their country is of great economic value to them. They should use this knowledge in instructing their children, and in restraining the native population in the war of extermination they are waging against their animal friends.

THE DESERT DORMOUSE

(*Graphiurus woosnami*)

The Desert Dormouse is a large and handsome species closely allied to the Angola Dormouse (*G. angolensis*), from which it is distinguished by the pale greyish-white colour of the back. Its description is as follows: the lower sides of the face are white, the base of each hair being slate and the tips white; eyes surrounded with dark rings; fore and hind paws white; under parts whitish, tinged with buff, each hair being slaty at the base and whitish at the tip. Tail long and bushy, light grey in colour, each hair being dark grey at the base and white at the tip. The extreme end of the tail is pure white.

The Desert Dormouse is an inhabitant of Bechuanaland.

DARLING'S DORMOUSE

(*Graphiurus platyops*)

The only place, so far, from which this species of Dormouse has been recorded is Southern Rhodesia. It is slightly larger than the Cape Dormouse (*Graphiurus murinus*), but closely resembles it in general appearance. It may be distinguished from the Cape Dormouse by its tail-tip, which is white. There are certain anatomical differences also. For

instance, when compared with the Cape Dormouse, its skull will be noticed to be broader and flatter, and its molar teeth smaller than those of any other species of South African Dormouse.

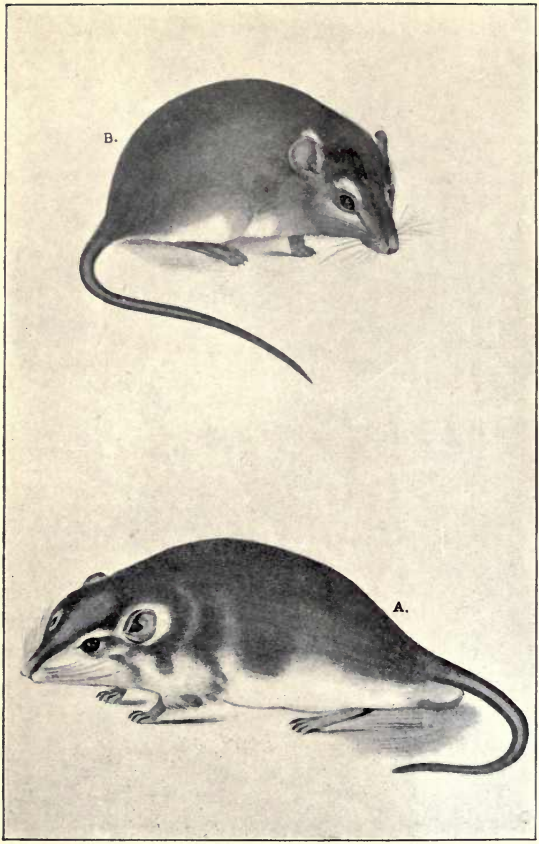
THE DWARF DORMOUSE

(*Graphiurus nanus*)

The Dwarf Dormouse is also an inhabitant of Southern Rhodesia, and is known to the Mashonas as the Sindiwara.

The Dormice often take possession of the nests of the Sociable Spiders. Mr. G. A. K. Marshall mentions in *The Fauna of South Africa* that these spiders construct nests of tough felted silk as large as a man's head, and intersected throughout with passages and chambers. In this the Dormice hollow out a chamber of suitable size, which they line with feathery grass heads, the downy seeds of various flowers, and even a few stray feathers.

Mr. Marshall found a pair of Dwarf Dormice and four young ones in one of these spider's nests. He was attracted by the spiders, which had swarmed out of the nest and were busily employed building another home. Judging by their agitation and the condition of their new nest, Mr. Marshall was assured they had been turned out of their old nest that day, or perhaps the day before. The young Dormice were evidently several days old, and the conclusion he was forced to come to was that



The Namaqualand Gerbille (*Desmodillus auricularis*) is an inhabitant of the dry wastes on the western side of South Africa. (A.) Male. (B.) Female.

From paintings by Sir Andrew Smith.

the mother Dormouse had carried them there, evidently having been threatened by some danger, or finding the spider's nest a cosier home.

Although, like the previous species, the tail-tip of the Dwarf Dormouse is white, yet it can easily be distinguished from it by its smaller size. Darling's Dormouse is about $4\frac{1}{4}$ inches long, exclusive of tail, while the Dwarf Dormouse is slightly less than $3\frac{1}{2}$ inches.

In colour it is lighter than Darling's Dormouse, the brown shade being much less apparent. From the roots of the whiskers to the eye and around it, is a black patch. Tail is slender at the base, and bushy; club-shaped and white at the tip.

DAMARALAND DORMOUSE

(*Graphiurus kelleni*)

THE only record of this species in South Africa is from South-West Africa. It is similar in size and general appearance to the Dwarf Dormouse, but differs in the hairs on the back, having pale rings with dark brown tips.

There are ten species and one local race of Dormice recorded from South Africa. Those not already mentioned are as follows:

Graphiurus pretoriæ.
,, *streeteri.*
,, *eastwoodæ.*
,, *griselda.*

Family: MURIDÆ

Sub-family: GERBILLINÆ

THE GERBILLE

Otherwise known as the Duin Rat or
Nacht Muis (Night Mouse)

ALTHOUGH a member of the mouse tribe, the Gerbille can easily be recognised by its short fore-legs and large back ones, which give it a kangaroo-like appearance; also in the following ways:

(1) Its eyes are comparatively large.

(2) The incisor or front teeth are narrow, and the upper ones have a longitudinal groove.

(3) The crowns of the molar teeth are sub-divided into transverse laminæ.

The Gerbilles are nocturnal and diurnal. They inhabit Southern Europe, Asia, and Africa.

In South Africa they occur in every part of the country. Although also found in the fertile eastern side of South Africa, the Gerbilles may be termed a desert-loving race of rodents, for, as a general rule, they are found in the arid desert-like districts.

There are a considerable number of species of Gerbilles in South Africa, most of which inhabit

the dry sandy districts on the west from the Cape, northwards.

The sand dunes amongst which the Gerbilles are usually found are covered more or less with patches of hardy, stunted vegetation. Where this cover is thickest the Gerbilles will be found. They congregate in families or groups, and form extensive burrows, which are approached by numbers of passages, so as not to interfere with one another in their journeyings in and out. In the burrows are large central chambers containing beds or nests of grass, where the Gerbilles congregate.

When a snake enters a burrow its inhabitants hastily leave it and scatter over the surface of the ground. The female Gerbille makes a nest of grass, which she shreds with her sharp incisor teeth. This nest is made at the extremity of a special burrow, where the young are born. The number of young at a birth averages from five to as many as fifteen, and now and then even more. The Gerbilles' most formidable enemies are various species of snakes, such, for instance, as the Mole Snake (*Pseudaspis cana*), the Ringhals Cobra (*Sepedon hæmachates*), Puff Adder (*Bitis arietans*), Night Adder (*Causus rhombeatus*), and the two species of Horned Adders (*Bitis cornuta* and *caudalis*). A number of carnivorous animals prey constantly upon the Gerbille, such, for instance, as the Mungooses, Meercats, Muishonds, Wild Cats, Jackals and Foxes. They are not even

safe from above, for the Hawks by day, and the Owls by night levy a heavy toll on them.

Although usually nocturnal by habit, the Gerbille is often seen abroad during the daylight hours, especially on cloudy days and towards sundown. While lying concealed in a bush watching the antics of a group of Gerbilles during the late afternoon, I observed a Black-shouldered Kite approaching. It was flying slowly at a height of about 50 feet from the ground. The instant it observed the Gerbilles below it checked its flight and dropped like a stone. So rapidly did it descend that I could barely see its form. In a moment or two, when within a few feet of the ground, the Hawk spread its wings and tail horizontally to check its descent and to enable it to see its prey. With a dash it seized a Gerbille with the talons of its left foot, and before the other Gerbilles could escape, it captured another with its beak.

When pursued, the Gerbille bounds off with great leaps after the manner of a Kangaroo.

The diet of the Gerbille consists of roots, bulbs, seeds, tender shoots of plants, the bark of trees, and any other form of edible vegetable substance. On account of its vegetation-eating propensities it does a considerable amount of harm to Man, both indirectly and directly. The vegetation which grows upon the sand dunes, and in the vast desert-like tracts of country in South Africa, is scanty at the most favourable of times. It, in consequence,

needs no natural check to its increase, therefore the Gerbilles, by devouring it, are helping the Sand Demon, which seeks to convert these arid wastes into real deserts of moving sand. It is not only the vegetation of the drier parts of the country which is attacked. The Gerbilles invade cultivated fields and pasturage, and the harm done by them is great. They are especially destructive to plantations. The young trees are seriously damaged or totally destroyed by their habit of gnawing the bark from the stems.

The Gerbilles, as a general rule, lie concealed deep down in their burrows by day, and consequently the farmer is handicapped in his war against them. In fact, owing to their secretive and nocturnal habits, the farmer is invariably quite unaware of their existence, and thinks the damage is done by ordinary rats and mice. Here, again, our bird and animal allies help us in the most practical of ways. In return for their services we persecute them and often encourage our children and servants to do likewise; yes, we wilfully turn upon and murder those who are unselfishly serving us all the time. When an animal or bird takes a little payment in the form of a few chickens, or a little grain in return for the most valuable of services, both it and all its tribe are outlawed and shot at sight. Such is the inconsistency of man.

When a colony of Gerbilles have eaten up all the edible vegetation in their vicinity, they migrate

during the hours of darkness and establish themselves in some other locality which will furnish them with the wherewithal to satisfy their appetites. Here they dig fresh burrows and once again begin the work of raising families.

THE SOUTH AFRICAN GERBILLES

THERE are a large number of species and local races or sub-species of Gerbilles known in South Africa. They have been separated into three genera. The typical ones most commonly met with are the following:

THE RED GERBILLE

(*Gerbillus pæba*)

THE Red Gerbille is an inhabitant of the dry sandy wastes of Namaqualand, Bechuanaland, the Kalahari and South-West Africa. It lives in small parties, and forms burrows in the sandy soil. The Red Gerbille is about 4 inches in length, not including the tail, which is somewhat longer than the body. The prevailing colour of the back is reddish-orange. The fur is slightly dark along the centre of the back owing to the presence of some long black hairs. The under parts are pure white. Tail round, and covered with short stiff hairs, which tend to become longer on approaching the tip. The tail is light brown above and white below.

THE CAPE GERBILLE

(*Taterona afra*)

The Cape Gerbille was known to the Dutch Voortrekkers as the Duin Rat, or Nacht Muis. It is commonly found amongst the sand dunes along the coastline of the Cape Province. It also occurs inland, being usually found in burrows amongst scrubby herbage, brushwood and short grass.

These Gerbilles are nocturnal, although on cloudy days they may be seen abroad.

The burrows are formed by a number of Gerbilles, usually near or in the midst of brushwood and scrub. These burrows are tunnelled in different directions so as not to obstruct one another. For the first foot or so from the surface of the ground the hole is oblique. It then runs horizontally for three or four yards. The various tunnels often communicate with one another. This is highly useful from a protective point of view, as it enables the Gerbille to effect its escape from a burrow by another exit should a snake enter in quest of it.

A nest is made of soft grass at the extreme end of one of the tunnels, and here the young are born and reared.

The fur of the Cape Gerbille on the back is fawny-brown, intermixed with black hairs; sides lighter in colour owing to the absence of black hairs. Under parts, including the chin, pure

white from the bases to the tips of the fur; ears large, oval and thinly clad with fine brown hairs.

The head and body averages 5 inches, and the tail $5\frac{1}{2}$ inches.

BRANTS' GERBILLE

(*Taterona brantsi*)

Brants' Gerbille inhabits Basutoland, the extreme north of the Cape Province, and the Transvaal.

This Gerbille is about 6 inches in length, not including the tail, which, unlike that of the two preceding species, is slightly shorter than the body. The general colour of Brants' Gerbille is pale rufous-brown on the back, streaked delicately but freely with dark brown. The fur becomes paler on the sides and merges with the dull white of the under parts. Head short and broadish at the back; ears oval and sparsely covered with hairs; point of the nose blackish-brown. Tail a warm brown above. The upper incisor teeth are orange, and the lower ones white, and much larger than those of the Cape Gerbille.

LOBENGULA'S GERBILLE

(*Taterona lobengulæ*)

Lobengula's Gerbille is so called because it inhabits Southern Rhodesia, which was formerly the

territory of Lobengula the Matabele King. Specimens have been obtained also on the Mababe Flats, Ngamiland and near Lake Ngami.

In Ngamiland periodic floods occur, which, strange to say, take place during the dry season. At these times Lake Ngami and the great Okovango marshes are filled, and hundreds of miles of dry sandy country and large areas covered with acacia trees are flooded. The various small mammals, including Lobengula's Gerbille, retire before the advancing water, and after the flood has reached its height, the land surrounding the marshy ground is often covered for miles with the holes of Gerbilles and other forms of mice and rats. When the land again dries up the fugitives return to their old haunts.

It is about $5\frac{1}{2}$ inches long from the point of the nose to the root of the tail; the latter is about an inch longer than the body. The fur is light fawn on the back, and finely grizzled with dull black; sides pale fawn; below white, the line of demarcation being strongly marked.

THE NAMAQUALAND GERBILLE

(*Desmodillus auricularis*)

This species of Gerbille was originally obtained by Sir Andrew Smith from Namaqualand, and is in consequence known as the Namaqualand Gerbille.

Although few specimens have been obtained, yet this Gerbille, apparently, is rather widespread in South Africa, for it is recorded from Namaqualand, South-West Africa, Kalahari, Griqualand West, and the neighbourhood of Kimberley. There is a specimen in the Port Elizabeth Museum from Ripon in Somerset East, and another from Perseverance in the Division of Uitenhage. The specimens obtained from Ripon and Perseverance were from the open grassy veld. The Namaqualand Gerbille forms burrows in sandy soil, usually in the grassy flats, or localities sparsely covered with Karoo bush; and also in the bush-veld. They live in small families, and the burrows are usually in little clumps of three or four. These rodents feed upon seeds, berries, tender plants, bark, roots; and like others of the mouse tribe, they prey at times on insects. The Namaqualand Gerbille can be recognised from all others of its kind in the following ways:

(1) Tail fleshy and shorter than the body, being about 3 inches long.

(2) Head large and with triangular appearance. Body short, stout, and about 4 inches in length.

(3) Incisors whitish, narrow, and only slightly grooved.

(4) Head broad, and the back part or tympanic bulla very much enlarged. Sole of foot with one large pad. Molar teeth transversely laminated.

(5) Upper parts, including head, tawny-brown;

on examination each hair will be seen to be slaty at the base for two-thirds its length, then ochre-yellow, and blackish at the extreme tips. A small white patch behind each ear. Abdomen and sides pure white, which extends in a curve over each thigh for two-thirds its breadth. The junction of the white and the brown of the back are sharply marked.

Sub-family: OTOMYINÆ

THE OTOMYS OR VELD RAT

THE Otomys or Veld Rat is an inhabitant of the grass-veld, Karoo-veld and bush-veld of South and East Africa.

It is known to colonists as the Veld Rat or Vlei Muis, and to the Mashonas as the Mappy. There are about a dozen species and sub-species so far known to science. The Otomys is common in all parts of South Africa where there is cover and food in the form of vegetation. It is rat-like in shape, but more robust than the common rat; its fur is grizzled ochre-brown and black, which varies in shade according to the species. Nose not so sharp-pointed as that of the barn rat; tail only about half the length of the body, and covered with scales and bristles; upper incisor teeth grooved; ears usually large; hind-feet short. The Otomys feeds upon seeds, berries, tender shoots, soft grasses, roots and bark. It will eat insects if they come in its way.

THE VLEY OTOMYS OR VLEY MUIS

(*Otomys irroratus*)

THE Vley Otomys inhabits the whole of South Africa, and is found as far north as Somaliland.

A Puff Adder in the act of striking a Bush Otomys.

A piebald Vlei Otomys (*Otomys irroratus typicus*).

The Vlei Otomys inhabits Africa from the Cape to Somaliland.

THE VLEY OTOMYS OR VLEY MUIS

This Otomys is commonly found on damp or marshy lands, and in dark-wooded Kloofs, and along the banks of spruits and rivers. It favours these places for the reason that the reeds, rushes and other forms of rank vegetation provide a comparatively safe retreat from its enemies, and because the roots of these forms of vegetation provide it with an abundance of food. Other favourite haunts are those portions of the veld where the grass grows rank and thick; the forest regions, and, in fact, wherever trees, shrubs, undergrowth, or other forms of vegetation provide a sufficiency of food and shelter, there this Otomys will be found.

It has regular beaten tracks under the matted grass or brushwood, and amidst the reeds and rushes. In a small patch of thick matted grass in my garden there were dozens of pathways beaten down hard by the constant tread of the Vley Otomys. In the most secluded spot in its retreat the female makes a nest of fine grass, or whatever materials are at hand. The grass is bitten into small pieces and shredded for the interior of the nest. In this nest the young are born and reared. The number at a birth averages from five to a dozen. In exposed situations burrows are made in the ground. In the neighbourhood of farmhouses, villages and towns the Otomys frequently makes its lair amidst old lumber, in refuse heaps, piles of wood, etc. On clearing away these materials, nests

are frequently found. While hunting amidst a collection of town rubbish, in the shape of old tins, bottles, etc., for snakes, I discovered a nest of a Vley Otomys in a biscuit tin. On opening the nest I found nine young ones already covered with hair. The Otomys breeds several times in the year, mostly during the spring, summer and autumn, although it is by no means uncommon for it to bring forth young in the winter months. It is therefore apparent, if enemies were not numerous, this species of rat would soon become a plague.

On the southern side of Port Elizabeth, what were formerly sand dunes have been planted with a species of Australian willow (*Acacia cyclopia*), and for some square miles there is now a dense forest of these trees, which are impenetrable by man in many places. The seeds from the trees cover the ground in great abundance, and are eaten with avidity by the Vley Otomys which, finding an inexhaustible food supply and ideal shelter, flourishes exceedingly. A line of railway ran through this forest, which is known as the "Dene," for the purpose of carrying out the town garbage in trucks. Wherever the garbage has been deposited there is a great collection of tins of divers kinds. Amidst these the Vley Otomys makes its home and rears its family. There are serpents, however, in the Otomys paradise, for the Puff Adders, Mole Snakes and Ringhals Cobras concentrate on these collections of old tins, and

they, too, make their home there, feeding whenever so inclined on the Vley Otomys and its family.

When the young are able to leave the nest they often troop after the mother in a crowd and hang on to her long fur with teeth and claws, or cling to her teats. Lying in the midst of a dense shrub, watching an open space in front of me in the heart of the "Dene," I was astonished to see a Vley Otomys, the size of a large barn rat, emerge from one of its beaten tracks in the brushwood. It was a mother Otomys and her brood. The youngsters were clinging to her back and sides with toes and teeth. She looked a grotesque object with her seven children clinging like ticks all over her. When she stopped walking the youngsters let go their hold and competed with one another for a drink of milk. Presently she grew tired of their attentions, and, pretending to be angry, she sought to drive them off. Losing patience at last, she began punishing them by inflicting light nips, which at last had the effect of causing them to retire along the burrow from whence they came. The mother then trotted off in search of a meal.

These Vley Otomys breed at an exceedingly rapid rate, and, in consequence, Nature has provided a large number of enemies.

They are preyed upon by the Mungoose, Muishond, Genet, Serval, Wild Cat, Jackal, Fox, and Honey Ratel. Hawks levy a heavy toll by day, and Owls by night. The Secretary Bird, too, is a

terrible enemy of the Otomys. The Puff Adder, Cobra, and sundry other species of serpents lie in ambush ready to inflict a bite which will almost instantly paralyse them; or, if they be non-venomous species such as Mole Snakes, they envelop the Otomys in their coils and squeeze the life out of it. The adult Python, of course, merely snaps them up in his powerful jaws and swallows them forthwith, for to him so small a morsel as an Otomys needs no constricting.

Man does a foolish thing when he kills snakes indiscriminately at sight. Several of them are quite harmless, such, for instance, as the Mole Snake (*Pseudaspis cana*), House Snake (*Boodon*), and the Python (*Python sebæ*). These non-venomous species of snakes render man immense services in killing rats and mice, and in return they are done to death on every available occasion. It is easy to learn to recognise these and other harmless species of snakes from the book entitled *The Snakes of South Africa, their Venom and the Treatment of Snake Bite*, or by forwarding the head and neck of a snake to me for identification.

The Vley Otomys averages 7 to 8 inches in length, not including the tail, which is about $3\frac{1}{2}$ inches long, scaly and covered with short bristles. The fur on the back is thick and rather coarse. It is slaty at the base; some of the hairs are tipped with black, and others brown, giving the animal a speckled appearance. Under parts are slaty and

white. The incisor teeth are stout, strongly curved, yellow, and the upper ones are deeply grooved. The lower incisors are also grooved, but the grooving is nearer the outer edge of the tooth than is the case in the incisor teeth of the upper jaw.

THE BUSH OTOMYS

(*Otomys unisulcatus*)

The Bush Otomys inhabits the Karoo and scrub-covered lands all over the Cape Province, including Namaqualand. It is common around Port Elizabeth, and in the neighbouring forest belts and scrub-covered flats, hill-sides and valleys. As a general rule, the Vley Otomys keeps to the marshy localities, and in the vicinity of ponds, spruits and rivers. The Bush Otomys, on the contrary, makes its home chiefly in the more or less sandy districts wherever there is a sufficiency of cover.

This animal has a peculiar but very effective way of protecting itself and its young from many of its enemies, and at the same time securing a snug and cosy home. It selects a low, thick shrub, or matted clump of grass, etc., and packs it full of small twigs or grass stems, from the ground to above the top of the shrub. In the interior of this citadel the Bush Otomys has tunnels in all directions. It also constructs burrows in the ground immediately beneath the shrub, and when threatened by a foe

it retires underground. On the Karoo where the vegetation is scanty it contents itself with forming a covering of twigs sufficiently close to the ground to retire under out of the heat of the sun. In the midst of this the Otomys has its burrow. These subterranean burrows, however, are of no avail against a snake, whose long sinuous body glides down the hole to its innermost recesses.

In the underground burrows the females make their nests of dry grass, or twigs and leaves, which they prepare by nipping and shredding to a suitable fineness. In these nests the young are born and reared. The Bush Otomys is slightly larger and somewhat darker in colour than the Vley Otomys. It can, however, easily be distinguished by an examination of the front or incisor teeth. In the Vley Otomys both the upper and lower front teeth are deeply grooved from the base to the tips, right down the fronts. On the contrary, an examination of the same teeth in the Bush Otomys will show that the upper incisors are lightly grooved towards their outer margins, but that *the lower incisor teeth are not grooved at all.*

BRANTS' OTOMYS

(*Otomys brantsi*)

Brants' Otomys is an inhabitant of the sandy wastes of Namaqualand and South-West Africa,

and has its retreats in patches of brushwood, and the various forms of hardy vegetation which grow on sandy soil.

Brants' Otomys is about 7 inches in length, and the tail averages $3\frac{1}{2}$ inches. It is yellowish-brown in colour, and, unlike those of the preceding species, the ears are small.

Sub-family: DENDROMYINÆ

THE TREE MICE AND THE FAT MICE

THERE is a tribe of Mice which are purely arboreal, and they are known, in consequence, as Tree Mice.

These Tree-dwelling Mice inhabit Africa south of the Sahara. In South Africa there are several species. Tree Mice have their home amongst the branches of trees, shrubs and vines, and in these leafy retreats they are exceedingly nimble, running along the stems with great rapidity, and springing with considerable agility from branch to branch. A nest is made in the most secluded and sheltered part of their leafy home, and there the young are born and reared. These nests are also used by the adult Tree Mice for shelter when the weather is chilly. Birds' nests are frequently taken possession of, such for instance as those of the Weaver Birds. The diet of the Tree Mice consists of berries, fruits, tender shoots, bark, small lizards, insects, birds' eggs and the nestlings. Their most dreaded enemy is the Boomslang or Tree Snake (*Dispholidus typus*). They are also preyed upon by Sparrow Hawks, Owls, Butcher Birds, Rollers, and the smaller tree-climbing carnivorous animals, such as the Wild Cats and Genets.

Genus : *Dendromys*

The Tree Mice grouped under this genus are small and slender, the body averaging 3 inches, not including the tail, which is scaly and sparsely covered with hairs, and slightly longer than the body. The upper incisor teeth are grooved and convex ; molars with tubercles in pairs more or less. The ears are rather large and hairy, and the claws long. Hind limbs not elongated as in the Gerbilles.

Several species inhabit South Africa.

THE CHESTNUT TREE MOUSE

(*Dendromys mesomelas*)

The Chestnut Tree Mouse is well known in South Africa. It inhabits the bush-covered districts from Cape Town to Port Elizabeth, and northwards to the Zambesi, and beyond to Tropical Africa. It lives amongst the branches of trees, shrubs and vines, and is difficult to catch on account of its nimbleness in running along the branches and twigs, and its agility in jumping. A nest is constructed amongst the foliage, and in holes in decaying tree-trunks. It often takes possession of birds' nests, in which its young are born and reared, and in which it shelters itself from rain and wind.

This Tree Mouse may be recognised as follows :

(1) Dull chestnut on the back, becoming paler

on the sides. Under parts white, slightly tinged with rufous. Black line down the centre of the back from the head to the root of the tail. Sometimes this black stripe is absent.

(2) Length of body 3 to 3½ inches. Tail 3 to 3¼ inches.

(3) Three claws to the toes of the fore-feet, and four to the hind-feet.

THE SMALL TREE MOUSE

(*Dendromys pumilio*)

The Small Tree Mouse occurs from the Cape to British East Africa. Its habits are similar to those of the Chestnut Tree Mouse, but it differs in the following ways:

(1) It is smaller, being about 2½ inches.

(2) No black dorsal stripe.

(3) Tail longer than the body.

THE GREY TREE MOUSE

(*Dendromys melanotis*)

The Grey Tree Mouse, like the others of the same genus, is an inhabitant of the bush-lands, from the Cape eastwards to Port Elizabeth, and up to Natal. It probably extends northwards to East Africa. The colour is grey, with a slight rufous tint. In length it is about 2¾ inches, the tail being slightly

longer. This species possesses the black dorsal stripe, and may readily be distinguished from the Chestnut Tree Mouse by its ashy-grey fur, and by its having only three claws to both fore- and hind-feet.

There are four other species of Tree Mice inhabiting South Africa, viz.:

Dendromys jamesoni.
,, *nigrifrons.*
,, *longicaudatus.*
,, *ayresi.*

Genus: *Steatomys*

The Mice which are grouped under this genus inhabit Africa, one species occurring south of the Zambesi.

These Mice may be distinguished from those of any other genera by their plump appearance, which is due to a layer of fat all over the body. Another characteristic is their short tails.

THE FAT MOUSE

(*Steatomys pratensis*)

Shana of the Mashonas.

THE Fat Mouse is so called because of its plump, well-fed appearance, due to a layer of fat which is stored up all over the body as a reserve supply of

heat and energy-producing food against the winter weather, and times of prolonged drought, when food becomes scarce. These Mice live in small colonies on the open grass-veld and bush-veld, and occur from the Transvaal up the eastern side of Africa to Nyassaland, and on the Mababe Flats in Ngamiland. They dig short burrows; these are rather shallow, and spread out for some distance into numerous ramifications. In such subterranean retreats they sleep and rear their families. Fat Mice are difficult to trap, but are easily dug out. Being so plump, they are naturally slow in their movements, and cannot escape from their enemies with the same degree of celerity as their less fat cousins. In one sense it is a distinct advantage to the Fat Mouse to lay up a store of rich fat as a provision against the cold of winter, which brings in its train almost nightly showers of frost, killing most of the vegetation on which this Mouse subsists. On the other hand, this fatness of body handicaps them severely in their efforts to escape from their enemies, which regard them as dainty morsels, and, consequently, seek them out with the greatest of eagerness. The Owl, the Hawk and the Fiskal Shrike are ever on the watch to pounce down upon them; while the Secretary Bird, with eyes specially developed to notice the slightest movement on the ground, tramps the veld and slopes from dawn till dark in search of them, or any others of their tribe.

The Mungoose, Muishond, the Wild Cats, Jackals and other carnivorous animals thin the ranks of the Fat Mice; and last, but by no means least, the snakes take a heavy toll. Amongst snakes, the Cobra takes the largest share in the hunting down of the Fat Mouse. This podgy little denizen of the open veld-lands is even preyed upon by man for food, for the natives of Mozambique relish it exceedingly, and, in consequence, hunt it with great diligence.

Genus: *Malacothrix*

There are two species of mice in this genus inhabiting South Africa. They are known as Mouse Gerbilles, and the only outward difference between them and the Fat Mouse of the genus *Steatomys* is that in the former the tarsus, which is the portion of the leg just above the toes, and in man is represented by the ankle, is more hairy than the tarsus of the Fat Mouse (*Steatomys*).

THE MOUSE GERBILLE

(*Malacothrix typicus*)

This Mouse Gerbille is an inhabitant of the Cape Province, principally towards the west. It has been found as far east as the district of Graaff Reinet. It is pale brown above, and white below, with slaty bases to the fur. Head and body about 3 inches

long; tail 1½ inches. The chief points which serve to distinguish it from the other species of the same genus are:

(1) Comparatively large ears (always over ·5).

(2) Four toes with claws on the hind-feet.

THE SMALL-EARED MOUSE GERBILLE

(*Malacothrix pentonyx*)

The Small-eared Mouse Gerbille is an inhabitant of the sandy flats of the western portion of the Cape Province.

It may be distinguished from the preceding species by:

(1) Its smaller ears, which do not exceed ·5 in length.

(2) Its hind-feet have five clawed toes, and not four, as in the other species of the genus.

Sub-family: Murinæ

The Typical Rats and Mice

This sub-family of Rodent animals includes the common Rats and Mice with which we are all so familiar; and a number of other species. The entire group of typical Rats and Mice in the sub-family *Murinæ* inhabit the Old World, with the exception of Madagascar, none of them being native to America. The common Brown Rat (*Rattus norvegicus*), the Black Rat (*Rattus rattus*), and the House Mouse (*Mus musculus*) occur in the New World, but they have been introduced there from the Old World by trading ships.

Genus: *Rattus*

The Rats and Mice of this genus are characterised by the incisor teeth being narrow and smooth; the crowns of the molars covered with tubercles; tip of the muzzle naked; fur soft, and sometimes mixed with coarse hairs; eyes large, bright and prominent; colour of the body plain; ears comparatively large; tail long, with overlapping rings of scales, and nearly destitute of hairs; a flat nail on the first toe of the front foot; all the other toes with claws; first and fifth digits not shortened.

This genus contains over 200 species, and is, in consequence, the largest in the entire mammalian class.

THE BROWN RAT

Also known as the Norway Rat; Barn Rat; Sewer Rat

(*Rattus norvegicus*)

THE original home of this Rat, which is such a curse to man, was Western China. From these regions it migrated all over Asia and Europe, and was eventually carried throughout the civilised world by means of trading ships. In about the year 1727 immense swarms of Brown Rats crossed the river Volga from Central Asia and swarmed over Europe, reaching its western shores and getting a footing in the British Isles about the year 1730. In South Africa it is common in all the towns and most of the villages, and has even found its way to isolated farms out on the arid Karoo, transported there in merchandise.

The Brown Rat is the largest and strongest of its family, and has already in most parts of the civilised world exterminated its weaker rival the Black Rat. Of all the mammal class of animals the Brown Rat is the greatest curse to the human race. Ever since it has appeared amongst us we have fought it, and have summoned the death-dealing vegetable and mineral drugs of the chemist to our aid, and

utilised the contrivances of the inventor; but in spite of poison, traps and cats, it holds its own.

The amount of damage done to the human race in a financial sense by this rat, amounts to hundreds of millions sterling annually. Unlike most other animals which destroy the fruits of Man's industry, the Brown Rat renders no service in return. It not only preys upon his food-stuffs, and damages various of his products, but it is a veritable sower of the seeds of death in communities of men, for it has been proven that the flea which lives on this rat is the creature which infects man with a fatal malady. Rats are subject to Bubonic Plague, and the fleas, biting an infected rat, transfer themselves to healthy rats and infect them. When a rat dies of Bubonic Plague, all its flea parasites abandon it, and should any of them get upon a man and bite him, they inoculate him with the microbes which cause Bubonic Plague. We therefore have two powerful motives in waging unceasing warfare against this rat until we succeed in exterminating it.

The indictment against it is by no means completed. It is an omnivorous feeder, and not only devours all the kinds of food-substances provided by man, but it destroys his chickens and the young of various pets, such as rabbits. It is also a terrible enemy of the wild birds, which, with few exceptions, are of the utmost possible value to us in our war against the army of noxious insects which are ever seeking to overwhelm us.

A Dutch farmer friend in Natal with whom I frequently stayed, and whose son for years accompanied me in my excursions in the wilds, was most careful not to allow native birds to be persecuted on his farm. In consequence, the plantations about the homestead were a paradise of bird life. However, the Brown Rats in the shelters afforded by the loose stone walls of the cattle kraals, and the spacious outhouses, had been steadily multiplying; and, finding the farmer's grain insufficient for their nightly needs, they began to forage further afield. Climbing the trees in the plantations, they devoured the eggs and young of the birds. We waged war on these hosts of rats in every conceivable way, but our efforts were unavailing, and, to our sorrow, our bird friends and trusty allies retired a mile away to a secluded kloof where this destructive rodent was unknown. The rats then invaded the orchard and vegetable garden, and dined upon vegetables and fruit, and even the bark of the trees and shrubs. An acre of pumpkins was ruined by them, for, in their desire to get at the seeds within, they nibbled holes through the pumpkin rind, and whenever the skin is damaged in this way the pumpkin rapidly decays.

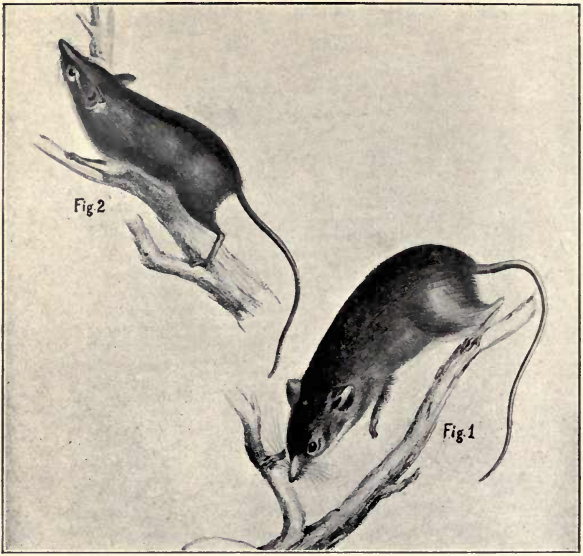
These rats, when pressed by hunger, enter hen roosts and devour the chickens, and even carry off the eggs in an unbroken condition, but just how they manage the business is somewhat of a mystery. It has been stated that the rat presses the egg

against its chest with its chin, and in this way carries it off. A rat is, as a general rule, incapable of gnawing a hole through the slippery shell of a fowl's egg, unless, for instance, it securely wedged the egg in a corner so that it could not roll about. There is little room for doubt that, like the Meercat, the Rat breaks the shells of fowls' eggs by tilting them with its nose or paws against some hard substance, such as a stone or wall. The Barn Rat is truly an omnivorous feeder, for nothing comes amiss to it. From the delicacies contained in the pantry of the housewife, its diet ranges to the produce in the outhouses, the contents of garbage barrels, manure heaps and privies. On account of these filthy habits, it becomes a source of grave danger to man and beast, for in its quest for food amongst the household garbage and various unmentionable filth, it gets smothered with disease microbes, which are carried by it to the food-stuffs in the various households, stables, cattle kraals, etc. Enteric fever, tuberculosis, and a variety of other serious diseases are spread in this way. The damage done in warehouses by the gnawing propensities of rats is immense. I happened to be present one day when a great case of cane-bottomed chairs was being unpacked. The case contained the cane seats of the chairs only, which were packed one upon another in piles. A Brown Rat, desirous of emigrating to South Africa, had hidden herself in the case before the lid had been nailed on. During the

voyage she gnawed a tunnel through the cane bottoms of two dozen chairs, and, carefully shredding the cane of the upper ones, she made a cosy nest and was rearing a family of nine children.

We glibly endeavour to explain the wonderful ways and habits of animals with the term Instinct. Now, the Dictionary definition of Instinct is "A natural, spontaneous impulse, especially in the lower animals, that moves them without reasoning towards the actions that are essential to their existence, preservation and development, and as reason would approve as tending to their welfare or to some useful end."

Several rats established themselves in the Port Elizabeth Museum, and, owing to its overcrowded condition and the nature of the building, it was impossible to hunt down and kill these pests. They soon began to multiply. Carefully removing anything in the form of food and water, we set a number of traps and succeeded in catching half-a-dozen. The rats soon learned to be wary, however, and although we at intervals employed every purchasable kind of trap, we rarely succeeded in catching a rat. We then resorted to poison, and in this way succeeded in destroying a few, but after a week or so the various poisoned foods and liquids remained untouched. From time to time traps and poisoned food were laid down and, with the exception of an occasional youthful rat, none fell victims. Now we may take it for granted that



[See page 104]

1. The Chestnut Tree Mouse (*Dendromys mesomelas*).
2. The Grey Tree Mouse (*Dendromys melanotis*).

From paintings by Sir Andrew Smith.

The Brown or Norway Rat (*Mus norvegicus*) is now cosmopolitan in distribution.

the adult rats at the beginning of our operations had learned their lesson by seeing their comrades captured or poisoned, but this does not account for the wariness of the several succeeding generations of rats, which were as careful to avoid the traps and poisoned food as were their parents and grandparents. The only apparent explanation is that rats have a means of communicating knowledge of vital importance to one another from generation to generation, and that they possess the capacity not only to receive the mental impression, but to understand it and act intelligently upon it.

The Brown Rat is a cannibal, and when food is scarce the stronger prey upon the weaker. It is also slowly but surely exterminating its cousin, the Black Rat (*Rattus rattus*), which, prior to the advent of the Brown Rat, had established itself in the various communities of men. The Brown Rat begins breeding when only about half-grown, producing four to six at a birth; but when fully adult it produces from five to fifteen at a birth, and several litters annually. The nest is made of any material available which can be shredded, such as straw, paper, cloth, bark, shavings, etc. The nest is placed at the end of a burrow, amongst lumber, under floors, in haystacks, or any other sheltered and secluded situation.

For some years we have kept a number of Albino Rats of the Brown species at the Port Elizabeth Museum. These breed at frequent intervals, pro-

ducing from five to a dozen at a birth. They begin breeding when about half-grown, and at this time produce as many as eight in a litter. The young when nineteen days old begin to feed. At twenty-two days they leave the nest and eat and drink the same as the adults, the mother refusing to suckle them. In another three weeks the mother brings forth a second litter. These albino Rats will not attempt to rear their young when several are confined together. The moment the young are interfered with by the others, they are eaten up, the mother herself partaking of the feast. It is necessary when breeding these rats to confine each pregnant female in a cage by herself, and to provide a cosy, dark nesting box, and materials in the way of soft hay, cotton, wool, bits of rags, etc., for her to build her nest with. Sometimes, apparently without cause, the mother will devour her entire family. At other times she will eat one every now and then, until but one, two or three remain. Sometimes she will scratch the youngsters out of the nest and allow them to perish with cold and hunger. However, as a general rule, the mother rat takes the greatest care of her young family, and will fight fiercely in their defence.

The White or albino Rat when gently handled soon becomes tame and will not attempt to bite. It likes to be fondled, and will cling about one's person for hours, or make itself quite at home in

the coat pocket. A female albino Rat wandered away one day, and was found a week later in an outhouse. To my surprise it subsequently gave birth to nine young ones, four of which were the normal greyish-brown, and the other five were pure white. It had evidently cohabited with a wild Brown Rat after it escaped. When albino Rats are mated, the fur of the progeny is always pure white, and the eyes are pink. Although I have bred these rats for eight years at the Port Elizabeth Museum, I have never had a single instance of even a slight tendency to reversion to the normal grey of their original ancestors. When the Brown Rats increase unduly in numbers and food becomes scarce, they assemble by common consent and migrate, often in large numbers, usually during the hours of darkness. Should a river bar their way, they plunge boldly into the water and swim across. Reaching a land of plenty, they scatter and seek out suitable homes.

It is well known that rats when brought to bay will turn upon dogs and men, and attack them in a most determined manner.

In the eighteenth century when prisoners were usually confined in dark, loathsome dungeons, the famished rats would swarm out and attack them; and many instances are on record of the Warder in his morning round, finding, instead of a prisoner, a white skeleton picked clean by the rats during the night. A case is related of a man, who entered

a disused coal-pit, being attacked by a swarm of rats and devoured.

The Brown Rat may be distinguished from its cousin the Black Rat in the following ways:

(1) Colour greyish-brown, often with a slight reddish hue on the back.

(2) Head and body of an adult about 12 inches in length. Tail usually shorter than the head and body, but sometimes about the same length.

The Brown Rat often breeds with the Black Rat and produces progeny which vary a good deal in coloration, length of tail, size of ears, and bluntness, or otherwise, of snout. This I observed frequently in Natal and at Port Elizabeth. Some of these rats were of the typical greyish-brown of the Brown Rat, but their tails were longer than the total length of head and body. Others were brownish-black in colour, with tapering noses and large ears, but their tails were shorter instead of being longer than the head and body, as in the typical Black Rat.

THE BLACK RAT

(*Rattus rattus*)

The Black Rat was common throughout Europe long before the advent of the Brown Rat, as it was known there as far back as the thirteenth century. From Europe it was carried in ships to practically every part of the world.

THE BLACK RAT

The Black Rat is not so large and strong, or so courageous as the Brown Rat, consequently the latter preys upon it, and it is slowly but surely disappearing before the advance of its more powerful cousin. In most of the older centres of civilisation the Brown Rat has annihilated the Black Rat.

In South Africa the Black Rat became established before the Brown species, and, although the latter for a long time has been preying upon it, yet it is still common in most of the towns and villages. In Cape Town the Black Rat was formerly very common, but it has now been driven out by the Brown Rat. In Port Elizabeth the Black Rat is still quite common. I advertised for rats a year or two ago and received some hundreds. An average of one-half of them were Black Rats. I confined some dozens of Brown and Black Rats in a large cage and caused them to be well fed, but nevertheless the Brown ones preyed upon their Black relatives from time to time, until all of them were eaten up. I then placed some fully adult albino Rats with their wild brothers and sisters, and to my surprise the Albinos attacked and ate them. I subsequently let some of these white rats loose in an outhouse which for some time had been infested with Brown Rats. Within a couple of weeks the latter had disappeared.

The Black Rat is supposed to have come from North Africa, India and Burma, where it is indigenous. Other races of this species of Rat

inhabit New Zealand, New Caledonia, and the Galapagos Islands.

In Europe and South Africa the Black Rat is bluish-black, but in Northern Africa, India and other parts of the East, there are several local races which vary in colour, one being brown above and white below; and another yellowish-brown or rufous. These races have spines mingled with the fur on the back.

In India the Black Rat often climbs trees and builds its nest amongst the branches. In some of the Islands in the Tropics it lives in the crowns of the coco-nut palms, feeding upon the fruit. In Europe, America and Africa, its habits and diet are similar to those of the Brown Rat.

The Bubonic Plague fleas, which live in the fur of Brown Rats, also infest the Black Rats, consequently this rodent is also one of the agents in the spreading of this terrible malady, for both the Black and Brown Rats are equally susceptible to infection. It is true the plague is more prevalent amongst Brown Rats than the other species, but this is due to the fact that the former harbour twice as many fleas as the latter.

The Black Rat in South Africa may be recognised in the following ways:

(1) Fur bluish-black, lighter on the under parts.

(2) Length of head and body of adult 7 to 8 inches.

(3) Tail thin and tapering, and longer than the head and body.

(4) It differs also from the Brown Rat in being smaller in general build; of more elegant shape; snout longer, projecting to a greater distance beyond the lower jaw; ears larger.

THE BLACK-TAILED RAT

(*Rattus nigricauda*)

The Black-tailed Rat is an inhabitant of the western side of Africa. It is common in Angola, and has been found as far south as South-West Africa, and is quite common in the Kalahari. It is a little over half the size of the common Brown Rat, the body of an adult, including the head, measuring only 7 inches. The tail is slightly shorter than the head and body, and is naked at the base, but towards the tip it is thickly covered with long, shiny black hairs. The fur is long and coarse on the back and yellow in colour, intermixed with black; sides yellower than the back; under parts pure white from the bases to the tips of the hairs. Ears large and thinly covered with light grey hairs.

Mr. Guy Dollman, in his field notes during an expedition to the Kalahari, says:

"These rats frequent the kameel-thorn forests all over the Kalahari, especially where the trees are large, and they seem more numerous in the neighbourhood of water. They breed and spend all the daytime in the trees, only coming down on to the

ground at night to feed. They generally choose an old hollow tree, into which a great quantity of dry grass is packed, sometimes as much as 20 feet from the ground. By setting fire to the nest they are easily smoked out, but not so easily caught, as they are very expert climbers, and jump from the ends of a bough into a bush and so to the ground and escape in the grass."

DARLING'S RAT

(*Rattus chrysophilus*)

DARLING'S RAT is an inhabitant of the northern parts of South Africa occurring in the Transvaal and Rhodesia. Beyond the Zambesi it ranges to Nyassaland. This Rat is known to the Mashonas as the "Mache."

Darling's Rat attains a length of about 6 inches; the tail is longer than the head and body. Bright reddish-fawn on the back, the fur being intermixed with black hairs; sides lighter; under parts white, the fur slaty at the base. This serves at once to distinguish it from the Black-tailed Rat, for the fur on the under parts of the latter is white from base to tip.

There are two sub-species or local races of Darling's Rat, viz.:

Rattus chrysophilus ineptus.
" " *acticola.*

THE NAMAQUALAND RAT

(Rattus namaquensis)

This Rat is an inhabitant of the sandy wastes of Namaqualand, Great Bushman Land and Bechuanaland. It is about $5\frac{1}{2}$ inches long, not including the tail, which is somewhat shorter than the head and body, and sparsely covered with bristles, which are black above and white below. Upper parts fawn, darker towards the hindquarters; sides lighter; below white with a bluish tinge; fur of back and sides slaty at the base, but not so on the under parts; the ears, which are large, have short white hairs inside; claws covered with white hairs.

Mr. Guy Dollman says: "This species does not climb trees, but I have frequently found their nests in old hollow trees which were lying on the ground. They are fond of frequenting rocks and the dry beds of spruits. When smoking out one of these nests once in a fallen tree, rather an extraordinary thing happened. For a long time there was no sign of any mouse, then suddenly the female came tumbling out on to the ground with four newly-born hairless young ones, apparently hanging on to her mammæ; she may have had one in her mouth, but three were certainly hanging on to the mammæ."

SMITH'S RAT

(*Rattus namaquensis lehocla*)

Smith's Rat inhabits the desert-like wastes of Namaqualand and Bechuanaland. It is dark brown on the back, rufus on the sides, and white with a rufus tinge below. Ears covered with fine hairs; feet white. Head and body from 4 to 5 inches; tail considerably longer, the tip with a strongly marked black brush.

THE GOLDEN RAT

(*Rattus namaquensis auricomis*)

The Golden Rat inhabits South Africa from the inland parts of the Cape Province to Rhodesia. It usually makes its home amongst the boulders on the stony hill-sides and on kopjes. This Rat is greyish-yellow on the back, and the fur is intermixed with black hairs; the under parts, including the feet, are pure white from the bases to the tips of the fur. Length of head and body $4\frac{1}{2}$ to 5 inches; tail longer.

THE DAMARALAND RAT

(*Rattus damarensis*)

The Damaraland Rat, as its name implies, is an inhabitant of Damaraland in South-West Africa.

This Rat is reddish-brown on the back, the fur, according to Sclater, being sprinkled with fine, dark hairs which are more pronounced along the middle of the back; sides paler than the back; below, including the feet, pure white; the ears, which are large, are covered with short reddish hairs on both sides.

Length of head and body 5 to 6 inches; tail same length, and covered towards the tip with dark purplish-coloured hairs.

The habits of this species are the same as those of the Black-tailed Rat.

VERREAUX'S RAT

(*Rattus verreauxi*)

Verreaux's Rat occurs in the south-western parts of the Cape Province. The fur is of a fawny-brown colour on the back, profusely sprinkled with black; sides paler; under parts pure white, but, unlike the preceding species, the fur has slaty bases; a black ring is present round the eye, which extends to the roots of the whiskers; tip of the nose white; feet white. Length of head and body 4 to 4½ inches; tail a good deal longer, bi-coloured, and towards the tip the hairs become longer, forming a distinct white brush. It can be distinguished from the preceding species by the presence of ten mammæ instead of six.

WAHLBERG'S RAT

(*Rattus pædulcus*)

Wahlberg's Rat has been recorded from the eastern part of the Cape Province. It probably extends from these parts northwards, at least to the Transvaal.

Wahlberg states the mother Rat carries her young attached to her teats when running or climbing. Colour of the back greyish-brown, which is darker in the backbone region, many of the hairs being tipped with black; sides grey; under parts white, with just a suspicion of slate colour at the bases; legs greyish-white.

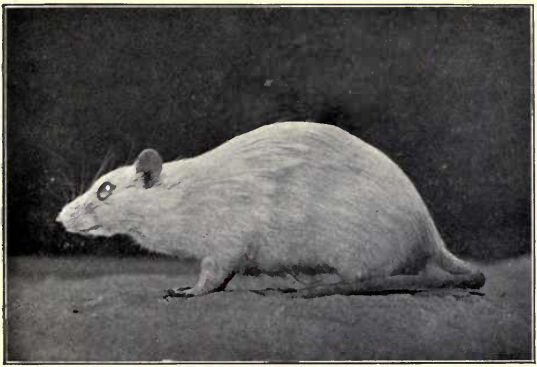
Length of head and body about $5\frac{1}{2}$ inches; tail slightly shorter.

BRANTS' RAT

(*Rattus colonus*)

Brants' Rat inhabits the Cape Province both east and west, and extends northwards through the Transvaal and Rhodesia.

This Rat is dark brown on the back, the fur presenting an almost black appearance along the middle of the back, owing to the presence of black hairs, which are longer than the rest of the fur; sides paler, with a slight rufous tinge; below, shabby white, the fur being slaty at the bases; feet whitish; tip of nose white; head and body about 4 inches;



Albino Brown or Norway Rat. These rats are bred in captivity and kept as pets.

White-nosed Rat (*Mus coucha*) from the bush-covered "Dene" at Port Elizabeth.

tail a little shorter, thinly clothed with bristles which are brown above and paler below; mammæ ten in number.

THE WHITE-NOSED RAT

(*Rattus coucha*)

The White-nosed Rat seems to be generally distributed throughout South Africa, and extends up beyond the Equator.

This Rat is usually found in situations which afford abundance of cover, such as the rank grasses and rushes in the vleys, the thick scrub and matted grass of the veld and hill-sides. It seems to have a tendency to become a house-dweller, for it has frequently been trapped in dwellings and outhouses. It builds its nest in burrows in the ground, in a thorny acacia tree, or any other suitable tree, shrub, or in dense scrub. The White-nosed Rat has rather long fur on the back, which is dark brown, owing to the hairs being tipped with pale brown and black intermixed; under parts dull white; feet pure white; claws nearly concealed by long white hairs which project beyond them; tip of the nose white; head and body about 5 inches; tail shorter, covered with bristles which are dark above and white below.

Owing to its wide distribution, this Rat varies a good deal in size and coloration. A local race which occurs in Zululand has been named a subspecies, viz. *Rattus coucha zuluensis*.

THE HOUSE MOUSE

(*Mus musculus*)[1]

The House Mouse is supposed to have originated in Asia. It is now cosmopolitan, having been imported by trading-ships to every part of the civilised world. In South Africa it is common in the towns and villages, and is even found on many of the isolated back-veld farms. This Mouse makes its home in the dwellings of man, where it lies hidden during the daylight hours in some secret hiding-place, and issues out at night in search of food. When not molested it soon becomes tame, and will eat up any crumbs which may fall to the floor when the family are having their evening meal. The House Mouse has a special liking for human habitations and their neighbourhood. It is omnivorous, and levies toll upon the contents of the pantry and barn. It has strong, gnawing teeth, and tunnels its way through planks with ease. It is exceedingly active in its habits, running with great rapidity, springing considerable distances, and climbing up nearly vertical surfaces. It can even climb hand over hand up a vertical wire if it is sufficiently thin to grasp.

The House Mouse, owing to its small size, is not

[1] The genus *Mus* now contains only the House Mouse and its nearest relations; the great majority of the species formerly included in *Mus* are now referred to the genus *Rattus*.

nearly so destructive as the Brown Rat, but nevertheless it does a considerable amount of mischief. Wherever it establishes itself it at once proceeds to make a cosy nest, by carefully shredding whatever materials there happens to be at hand. In this way the most expensive of clothing, books and other goods are destroyed. At the Port Elizabeth Museum we had occasion to clear out a large cupboard full of journals and miscellaneous literature, and in the midst of it we discovered several nests of House Mice which had been carefully made by nibbling the paper and book-bindings into minute fragments. This Mouse brings forth four to five litters of blind, helpless, hairless, pink babies annually. From three to eight young ones are born in a single litter. It can thus easily be seen that the House Mouse would soon become a plague if its numbers were not kept severely in check by poisoning and trapping.

When food is scarce the House Mice become cannibals, the stronger preying upon the weaker. The white and pied mice which children keep as pets, are albino or partial albino House Mice. The House Mouse is attracted by musical sounds, especially of a soft and subdued kind, and will often venture from its retreat and listen attentively. The mice known as Japanese Waltzing Mice are domesticated House Mice. They originally came from China. It was generally believed that the waltzing or gyrating habit of these mice was due to

an affection of the labyrinth of the ear; but after a careful examination of their auditory organs, Dr. K. Kishi has concluded that the waltzing habit has been developed owing to confinement for a great many centuries in small cages in which they were obliged to run in tiny circles.

In South Africa the chief natural enemies of the House Mice are snakes. Venomous snakes, of course, cannot be permitted to take up their quarters unmolested in dwellings and outhouses, but all snakes are not venomous. There are a good many species in South Africa which are quite harmless, for they do not possess any vestiges of grooved fangs or poison glands, and are, in consequence, as innocent as lizards. One of these harmless species of snakes, known as the Brown House Snake (*Booden lineatus*) is generally distributed throughout South Africa and Tropical Africa. A peculiarity of this snake is its partiality for human habitations and their vicinity. Its body is long, cylindrical and tapering, and eminently adapted for pursuing mice to their most secret retreats. Guided by its keen sense of smell, it relentlessly hunts them down, and penetrating to their nests it makes a meal of the entire family: This snake feeds almost exclusively on mice and young rats, and in consequence is of the utmost possible economic value. However, owing to the prevailing belief that all snakes are venomous, and also to the general inability to recognise one species of snake from another, this valuable friend is killed at sight.

The best way by which a knowledge of the economic value of hosts of animals, birds and reptiles may be spread, is to have Natural History taught to School-children.

THE FIELD MOUSE

(*Leggada minutoides*)

The Field Mouse is widespread throughout South Africa both west and east. It is known to extend as far north as Uganda.

This Mouse inhabits the veld and low hill-sides, and constructs short burrows in which it rears its young, and conceals itself from its enemies, which are chiefly the birds of prey, viz. Owls and Hawks.

The Field Mouse is sometimes found inhabiting dwelling houses and outhouses.

It lives on the seeds of grasses and shrubs, and various forms of vegetable matter. Insects are devoured by it when they happen to be available, but it does not specially seek after them.

The Field Mouse is a small and elegant little creature. The fur is coarse and fawn on the back, darker along the middle of the back owing to the admixture of black hairs. The hairs on the upper parts are pale slate at the bases. Under parts pure white from the bases to the tips of the hairs. The separation of the white of the under parts, and the fawn of the sides and back is clearly defined

Ears moderate in size and nearly destitute of hairs. Claws rather large and not concealed by the hairs, which are white. Head and body 2½ inches long; tail about 2 inches, covered with white bristles.

This Mouse was formerly grouped under the genus *Mus*, but owing to certain differences in the skull and teeth, it has now been placed in a separate genus, viz. *Leggada*.

THE LONG-TAILED RAT

(*Thamnomys dolichurus*)

The Long-tailed Rat is found in all parts of Africa, from the Cape Province in the south, to Algeria in the north, wherever the environment is suitable to its arboreal habits. This species of Rat lives in trees, and makes its home in the hollows of the branches and tree-trunks, or in bush-birds' nests. Peters says it carries its young attached to its mammæ. This is a habit of several species of rats and mice. The Long-tailed Rat is rich brown on the back, with a reddish tinge posteriorly. Ears almost naked, large and roundish. Under parts pure white, the fur having no slaty bases; legs white with a rusty tinge. Length of head and body about 5 inches; tail 6½ inches.

Genus: *Cricetomys*

There is only one species of rat in this genus. A local race has been found to differ slightly, and it, in

consequence, has been named a sub-species (*Cricetomys gambianus cunctator*). This Rat has been placed under a separate genus to those in the genus *Rattus* for, unlike the latter, it possesses cheek pouches in which to store up food.

THE GIANT RAT

Otherwise known as the Gambian Rat

(*Cricetomys gambianus adventor*)

The Giant Rat is an inhabitant of Tropical Africa. It has also been discovered in the extreme north-east portion of South Africa, and therefore is included in the list of South African species. The Giant or Gambian Rat lives in long burrows tunnelled under dense bush and scrub. It feeds on a variety of vegetable substances, and is very fond of wild fruits and berries, which it often carries off to its burrow. Its flesh is eaten by the natives, and is stated to be very good. This Rat is inclined to infest dwelling houses, barns, drains and piles of lumber; and owing to its large size it is capable of doing a great amount of damage. As its name implies, the Giant Rat is of unusual size, attaining a length of 2 feet from the tip of the nose to the root of the tail. The latter is longer than the head and body. The fur of the back is coarse and pale brown, with a slight grizzled appearance owing to the tips of the hairs being yellow and black. The

under parts are shabby white; ears oval and almost destitute of hairs; a dark ring round the eye; the tail, which is longer than the head and body, is sparingly covered with short bristles, which are brown for two-thirds the length of the tail, and white at the tip.

According to Francis, the Giant Rat is known to the natives at Inhambane as the Magwinga or Inyakwinga.

Genus: *Saccostomus*

The Rats of this genus differ from others of their tribe in possessing internal cheek pouches, short limbs and tails, and the body being stout and robust in appearance.

THE POUCHED RAT

(*Saccostomus campestris*)

The Pouched Rat inhabits the eastern parts of the Cape Province, and extends up through Natal to Tropical Africa.

This Rat forms a burrow which has a separate entrance and exit. In this burrow, chambers are hollowed out which serve as dwellings and storehouses. During the summer season the Pouched Rat lays up a store of seeds for winter use. Owing to its fondness for grain it often makes its home in and near cultivated fields. It is also often met with in plantations, and in scrub-covered localities. I

The Pouched Rat (*Saccostomus campestris*) stores the farmers' crops in a subterranean chamber.

The Striped Rat (*Arvicanthus pumilio*) inhabits the bush-veld, fields, and gardens, and is common throughout South Africa.

have occasionally observed it at Port Elizabeth, where it has its burrows amongst the roots of the acacia trees which were introduced from Australia. The Pouched Rat feeds upon the black, hard seeds of this tree, which fall upon the ground in great profusion. A pound and more of the seed has been found in one of its subterranean storehouses.

The Pouched Rat is nocturnal by habit, but ventures forth on cloudy days, and during the late afternoon in search of food. When surprised a few yards away from its burrow it can be captured with ease, owing to the slowness of its movements. Those which I have surprised in the open, moved off at a rather slow trot, and were overtaken at a walking pace. They often make their burrows in the midst of old tins and lumber, or dry town refuse, and in sod fences. The Pouched Rat is fat and juicy, and is often eaten by the natives. It is not an animal which is likely to increase unduly in numbers owing to its sluggishness and consequent inability to escape from its many enemies, such for instance as the Mungoose, Muishond, Genet, Wild Cat, Owl and Snake. The Pouched Rat is helpless against the latter, which pursue it to the innermost recesses of its burrows. Amongst snakes, the harmless Mole Snake (*Pseudaspis cana*) is its most formidable enemy. This species of rat can easily be recognised in the following ways:

(1) Body plump; head broad and thick; fur on the back and sides slaty-brown, the hairs being slaty

at the base and the tips pale brown, intermixed sparingly with black-tipped hairs. The fur of the back is darkest along the backbone region.

(2) Under parts pure white from the bases to the tips of the fur. The brown of the sides and white of the under parts do not gradually merge, but are sharply distinct.

(3) Feet short and white; whiskers are composed of fine hairs which are mostly white.

(4) Head and body 5 to 6 inches; tail thin and undeveloped, 1 to $1\frac{3}{4}$ inches in length, and sparsely covered with fine hairs.

THE MASHONALAND POUCHED RAT

(*Saccostomus mashonæ*)

This species of Rat inhabits Rhodesia, and is known to the Mashonas as the "Sugu." It differs from the preceding species in being iron-grey on the back and slaty-grey, with grey-drab tips to the fur; and by the middle, upper, molar tooth having a small but distinct extra, outer, anterior cusp. This cusp in the preceding species is barely visible.

ANDERSSON'S POUCHED RAT

(*Saccostomus anderssoni*)

This Pouched Rat inhabits the West of Africa, from Angola to South-West Africa, and Bechuana-

land. It resembles the Pouched Rat (*Saccostomus campestris*) with the exception that its fur is lighter, with a sandy tint, instead of slaty-brown.

It feeds largely on the seeds of the wild acacia (kameel-thorn) trees.

THE SMALL POUCHED RAT

(*Saccostomus fuscus*)

This Pouched Rat has been recorded from Inhambane in Southern Mozambique. It is smaller than the previously mentioned Pouched Rats, averaging 3 to 3¼ inches in size from the nose to the root of the tail, instead of 5 inches as in the others. It also differs in the following ways:

(1) The nose is more sharply pointed.

(2) The ears are more thickly covered with hairs.

(3) Under parts are grey, and the claws of the feet are black.

Genus: *Acomys*

The Mice of this genus are small, with the hinder parts of the back covered with flattened, grooved, stiff spines (Sclater). Most of the species in this genus inhabit Africa and the drier south-western parts of Asia. One species is recorded from Celebes.

There are two species of Spiny Mice recorded from South Africa, viz. the Spiny Mouse (*Acomys subspinosus*), which is stated to occur in the Cape

Province, and Selous' Spiny Mouse (*Acomys selousi*) from Rhodesia and East Africa.

In the former, the fur on the back is light brown, and paler on the sides; under parts pure white; a yellowish ring round the eye; back covered with coarse, spiny, flat hairs; head and body about 3¼ inches; tail shorter than head and body. The difference in the latter species is:

(1) Tail longer than the head and body.

(2) Back rufous-brown with a smoky hue.

The former is recorded from the Cape Province and the latter from Rhodesia.

Genus: *Dasymys*

Rat-like animals with moderate, somewhat hairy ears and rather coarse fur; tail moderately scaly and very sparsely haired; skull somewhat intermediate between that of Gerbillus and Mus. The antorbital plate is produced forwards in hooked shape (Sclater). There is one species and a subspecies. The typical species, which is known as Peter's Water Rat (*Dasymys incomtus typicus*), has been recorded from Natal. This rat is rather large, being from 6 to 6½ inches in length, not including the tail, which is slightly shorter than the head and body. The fur, which is very thick, is dark brown on the back, paler on the sides, and whitish on the under parts. The body is thickset; ears round, short but broad, and clothed with hairs; feet dark brown;

tail with short bristles, and uniform in colour. The sub-species which occurs in Rhodesia differs from the typical species in being of a dark sooty-black, the yellow grizzling being very slight. It is named *Dasymys incomtus fuscus.*

Genus: *Arvicanthis*

There are no distinct or definite characteristics to justify us in separating these Mice from those grouped under the genus *Mus.* Their separation is a matter of convenience chiefly. They differ from the true rats in being striped on the back, and by reason of the first and fifth fingers and toes being very short.

THE STRIPED RAT

Also known as the Striped Mouse and Striped Field Rat.

Lemniscomys & *Rhabdomys;* or *Arvicanthis* of Sclater

THE Striped Rat is common in every part of South Africa from west to east, and northwards to Tropical Africa. There are about a dozen local races which are termed sub-species. These vary both in size, colour and markings. For instance, in Rhodesia a local race occurs which is darker than the typical species on the back, the dorsal stripes are clearly defined, and the under parts are tinged with orange-yellow. On the contrary, a local race from

Bechuanaland is almost sandy on the back, the dorsal stripes being very indistinct, and the ears pale. The habits of all these local races of the Striped Rat are more or less similar.

They are found wherever there is suitable cover in the shape of thick tussocks of grass, brushwood, scrub and bush, usually in the neighbourhood of water.

The Striped Rat does not as a rule form a burrow. It builds a nest of grass, leaves, fibres and moss, or any other suitable material which may be at hand. The nest is placed in the centre of a dense shrub, in a tussock of grass, amongst the roots of a tree, on the ground, under a mass of brushwood, in or under old tins, lumber, etc. When grass is available it is always utilised for nest building. The grass is carefully shredded for the interior of the little home, in which a pair of Field Rats dwell. When the time for breeding arrives, which occurs several times annually, the female takes possession of the nest, lines it with softer material, and brings forth a litter of from five to a dozen blind, helpless babies. As soon as these are reared and sent off into the world, another family is forthcoming.

Although the Striped Rat is common in gardens, it does not show the slightest disposition to become a house-dweller, like its cousins the Black and Brown Rats.

The Striped Rat is common in and about Port Elizabeth, and may often be met with in gardens, even in the centre of the city.

It feeds upon a variety of vegetable substances, bark, roots, seeds and berries. It will also eat snails, insects, bird's eggs and nestling birds with avidity.

I kept a number of these Striped Rats in a cage at the Port Elizabeth Museum but, although they were abundantly fed, the stronger preyed upon the weaker. Three or four would suddenly act in concert, and attack one which they seemed to have specially singled out. When it was slain a struggle would occur for a share of the body.

I captured a pair in a nest in an old wide-mouthed preserve jar which was lying amongst some town rubbish. I placed the pair with the nest in a cage. The female rebuilt the nest in a dark corner, and added some cotton wool to it which I provided; and in a week's time a litter of nine, tiny blind babies were born. The mother succeeded in rearing them all, the other parent not interfering in any way.

This was in the month of November. The young rats were handled freely and grew up quite tame.

The Field Rat may be seen abroad in search of food both by day and by night. They love to bask in the warm sunshine, but on the slightest cause for alarm they dart with great rapidity into the nearest cover.

When seized, the Striped Rat bites viciously, and emits a series of curious metallic chirps, which are in reality a succession of terrified shrieks.

These rats swarm in the forest known as the "Dene," near Port Elizabeth. This is due to

the abundance of cover afforded; and the profusion of seeds which fall to the ground from the acacia trees, constitute their chief diet. They do not increase sufficiently, however, to become a plague.

Striped Rats are good food for a host of creatures which foregather and prey upon them, and, being provided with such an excellent food-supply, they in turn increase rapidly in numbers.

Thus does Nature restore the balance, when not ignorantly interfered with by Man.

In this forest the chief enemies of the Striped Rat are Puff Adders, Ringhals, Mole Snakes, Mungooses, Muishonds, Wild Cats and Owls.

In more open situations the Hawk and the Secretary Bird levy a heavy toll upon these rats. The latter bird, after killing the rat with a blow of its horny foot, or powerful curved beak, swallows it whole. I have found as many as eight Field Rats in the crop of a Secretary Bird.

There are two distinct types of Striped Field Rats.

The chief difference between these two types is as follows:

The Field Rat (*Rhabdomys pumilio typicus*) and its local races have four black stripes along the back, the fifth finger being normal and fairly well developed.

On the contrary, the Single-striped Rat (*Lemniscomys dorsalis typicus*) and a local race (*Lemniscomys*

dorsalis calidior) have only one black stripe on the back, and the fifth finger is quite rudimentary and provided with a flat nail.

The common typical Striped Rat (*Rhabdomys pumilio typicus*) is a rather thick-set little creature, with large black eyes encircled with a whitish ring; pointed nose; round, prominent ears, covered on the inner side with short rufous hairs.

The fur of the back is short and crisp, greyish-brown in colour, shot with rusty red, which is most pronounced on the hindquarters. The chief distinguishing mark is the presence of four black stripes which run from behind the ears to the root of the tail. Average length of head and body, 5 inches; tail slightly shorter.

THE SINGLE-STRIPED RAT

(*Lemniscomys dorsalis*)

This Rat is distinguished at a glance from the preceding species by the presence of a single black stripe running down the centre of the back from the neck to the root of the tail.

It is met with in the northern parts of the Cape Province. North of the Orange River it is common. From these parts it extends northwards through Rhodesia to Tropical Africa.

It is known to the Mashonas as the Chewanga-ranga.

This Rat may be recognised in the following ways:

(1) A single black stripe down the centre of the back.

(2) Tail longer than the head and body.

(3) Fifth finger quite rudimentary, and furnished with a flat nail.

Genus: *Pelomys*

Rat-like animals with short, rounded heads, and somewhat coarse, bristly fur; the fifth finger of the fore-limb is short and rudimentary; the tail is long, scaly and rat-like; skull with compressed palate; upper incisors grooved; molars low and broad, with a triple row of tubercles in upper jaw, and a double row in the lower jaw. Soles with five pads.

The grooving of the incisors and the shortness of the fifth finger at once separate this genus from *Mus*, which it otherwise closely resembles (Sclater).

Species of this genus occur in India and Africa.

THE SWAMP RAT

(*Pelomys fallax*)

Golunda fallax of Sclater.

The Swamp Rat, also known as the Bush Rat, inhabits Rhodesia, and northwards to Tropical Africa.

As its name implies, it frequents marshy lands, and the banks of streams and ponds.

It feeds upon the rank herbage and roots, and constructs deep burrows.

This rat is relished as an article of diet by the natives of Angola.

The Swamp Rat attains a length of from 6 to 7 inches, not including the tail, which is somewhat shorter than the head and body.

The fur of the back is coarse and speckled yellowish and dark brown, with a darker dorsal stripe. Sides paler than the back; under parts grey; tip of nose rufous-brown; ears covered with rufous hairs; fifth finger short, with a nail-like claw.

Sub-family: CRICETINÆ

Genus: *Mystromys*

RAT-LIKE animals with soft, rather woolly, fur and large broad ears, short tails, and a somewhat hairy tarsus; skull with antorbital foramen forming a long oval hardly at all narrowed below, and the perpendicular plate but little developed, not extending forwards beyond the upper root of the zygoma; incisors ungrooved, molars rooted, those of the upper jaw with tubercles arranged in a double instead of a treble row, as in the *Murinæ;* those of the lower jaw, as in the *Murinæ*, in a double row (Sclater).

The genus *Mystromys* is confined to South and Central Africa.

THE WHITE-TAILED RAT

(*Mystromys albicaudatus*)

THIS Rat has been recorded from the Cape Province, Orange Free State, Transvaal and Rhodesia. It is nocturnal by habit and lives in burrows on the grass-veld, low hill-sides and other more or less similar situations. Like many others of the rodent tribe, it may often be seen abroad on cloudy days. According to Smith it is especially active during rainy weather.

The White-tailed Rat is about 4 inches in length, not including the tail, which is about 1½ inches long. The tail is covered with whitish hair above, intermixed with a few black hairs, and the under part of it is pure white. The general colour of the back is dark brown.

On close examination the fur will be noticed to be slaty with brown tips. The under parts are paler than the back. Legs slender, feet covered with white hairs which nearly conceal the claws; ears large and broad, the inner half of the conch whitish, and the outer half black; incisor teeth light yellow and ungrooved.

THE WHITE-FOOTED RAT

(*Mystromys albipes*)

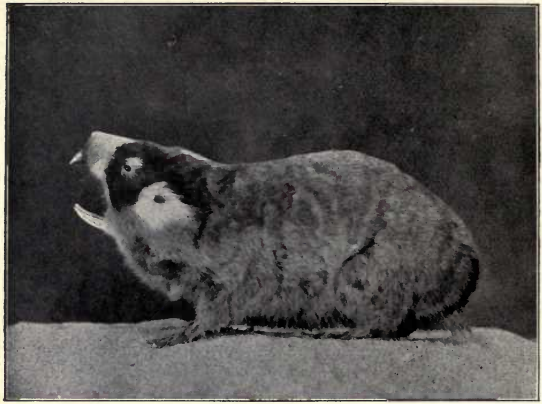
This Rat has been recorded from the western parts of the Cape Province where it inhabits the grassy and stunted bush-covered flats.

The White-footed Rat can at once be distinguished from the other species of the genus *Mystromys* by reason of it being nearly twice as large, the average length of the head and body being 7 inches; whereas in the former the length is about 4 inches. General colour light brown on the back, and white on the under parts. Feet of both fore and hind limbs white; the claws are almost concealed by the hairs.

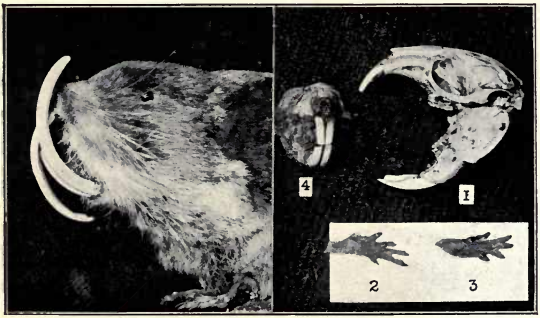
THE BLESMOL, MOLE RAT AND SAND MOLE

(*Georychus and Bathyergus*)

THE creature which has brought down persecution sharp and fierce upon the innocent Golden Mole is a rodent or gnawing animal known as the Blesmol. The word Blesmol means a "Mole with a white forehead." There are several species. The common kinds are the Cape Blesmol (*Georychus capensis*), the Mole Rat (*Georychus hottentotus*) and the Sand Mole (*Bathyergus suillus*). These burrowing rodents can easily be distinguished from the Golden Moles. Their front or incisor teeth, of which there are two in each jaw, are large, curved and prominent; the eyes are small but visible. Although a burrowing animal, the front claws are not large, as is the case with the Golden Mole, which has the third toe on each of the front feet considerably developed. The Golden Mole is tailless, whereas the Blesmol, Mole Rat and Sand Mole have short tails. In the Golden Mole the fur is close—it has a metallic sheen—and is either coppery-red or blackish in colour. On the contrary, the fur of the Blesmols, Mole Rats and Sand Moles is usually grey above and whitish below, without any sheen on the fur.



The Cape Blesmol devours the root crops of the farmer, and the useful insect-eating Golden Mole gets all the blame.



A Mole Rat with abnormal incisor teeth. 1 and 4. Dentition of a Mole Rat. 2. Front foot. 3. Hind foot of a Mole Rat.

These mole-like rodent animals tunnel in the ground and cast up hills after the manner of the Golden Moles of South Africa. They are found in both cultivated and uncultivated lands. They, however, prefer the former, for the reasons that the soil is easier to tunnel through, and because of the succulent root crops which constitute the diet of these animals. In their tunnelling operations, it is necessary to get rid of the excavated earth, and this is thrown up in the form of hills, which mark the direction of the excavation. At intervals, branching tunnels are constructed for the purpose of reaching some coveted root which, if not devoured at once, is carried away to the end of the main tunnel and stored up in a specially-constructed roundish chamber with smooth walls, capable of holding a considerable quantity of provender. Here the animal packs away a large store of roots, bulbs, tubers and seeds for winter use.

The bulbs have the tops carefully bitten off to prevent them from sprouting. When potatoes are available, all other forms of diet are neglected, and, entering the potato fields, these destructive rodents carry off the tubers to their subterranean retreats and store them up. The crafty little fellows are well aware that in the moist earth the potatoes would soon begin to sprout, so, to prevent this, the buds or eyes of the tubers are carefully nipped out.

If kept in captivity and fed on bulbs, roots, tubers and fruits, these little animals live and thrive, but

the cage must be warm, and earth provided for the creature to amuse and exercise itself in, by burrowing.

Blesmols when first placed together in captivity instantly fight, and invariably damage each other so severely that both succumb to the wounds inflicted by the large front teeth. Often the victor devours portions of the victim. Their powers of vision are very limited for, when placed together, Blesmols see each other but dimly, and apparently each is aware of the proximity of the other chiefly by the sense of smell.

These animals make interesting pets, and in course of time become tame; but it is inadvisable to attempt to handle them for, without warning, they often become excited and bite fiercely. When desirous of keeping several in the same cage, it is necessary to isolate the newcomer behind a wire mesh partition until the others become familiar with it. If the partition be then withdrawn they will not fight.

The curved incisor teeth of these animals, as well as those of other kinds or species of rodents, are constantly growing, but are kept from over-development by daily use. The front surfaces of the teeth are covered with hard enamel, but the under part of each tooth is of soft dentine. The result is that when the teeth are used for gnawing, the comparatively soft under part wears away at and near the tip, leaving the enamel, which provides a sharp cutting edge. In this way the incisor teeth are kept sharp and effective.

The Sand Mole (*Bathyergus suillus*) burrows in the sandy soil of the coastlands. It attains a length of 17 inches.

On the right—Mole Rat (*Georychus hottentotus typicus*). On the left—Darling's Blesmol (*Georychus darlingi*). It has a white spot on its crown.

In a specimen in the Port Elizabeth Museum, the incisor teeth of the upper and lower jaws did not meet evenly. This resulted in an abnormal growth of the teeth. The creature was adult and in good condition when captured, and in spite of its crippled dental condition it had evidently been able to provide sufficient food for its needs. How it did so is a mystery, for the incisor teeth were not only useless, but a distinct hindrance. It possibly worked bits of root, small bulbs and seeds into its mouth by dint of great perseverance.

Although these burrowing rodents are destructive to root-crops, they fulfil a mission, and a useful one, for, like the Mole, they are Nature's ploughmen. In the search for food they tunnel the ground in all directions, throwing up mounds of earth and loosening the soil, which allows the rain to percolate down into the sub-soil. Land which slopes more or less would become so hard on the surface, unless disturbed by Moles, Blesmols and other burrowing creatures, that when rain fell upon it the water would rush away. In time all but the hardiest forms of vegetation would die off, and eventually the land would become desert-like, unless, of course, a great abundance of rain fell.

The giant among these burrowing mole-like animals is known as the Sand Mole or Zand Mol. It is also called the Duin Mol and Hippopotamus Mole. There are two species in South Africa; the common one is known to scientific men as *Bathyergus suillus*

(Maritimus of Sclater). The Sand Mole attains a length of about 18 inches, and is the largest of these burrowing rodents.

It is common along the coast of South Africa, from Namaqualand in the west, to Knysna in the east. It has not, so far, been discovered as far eastwards as Port Elizabeth.

The Sand Mole was known to the early travellers. It was first fully described by Colonel Gordon, who then commanded the Dutch forces, prior to the Cape coming into the possession of the British in 1795.

The Sand Mole inhabits the dunes, flats and other sandy localities along the coast, and forms tunnels or burrows, throwing up the sand at intervals in large hills a foot high. In many parts of the Cape flats the ground is tunnelled in all directions by these Sand Moles, and in consequence horseback riding is dangerous. The excavations are made by the animal in its search for roots, bulbs, tubers and other vegetable substances which constitute its diet.

Occasionally the Sand Mole, Mole Rat and Blesmol venture above ground, and on these occasions they can easily be captured. Realising it cannot hope to escape by flight, for its movements above ground are comparatively slow, it instantly faces the enemy and puts on a most threatening aspect, emitting a series of hissing grunts, resisting capture with the greatest determination. There are several species of Blesmols and Mole Rats in South Africa.

The Cape Blesmol (*Georychus capensis*) is abundant

in Namaqualand and the western parts of the Cape Province, and extends eastwards to Port Elizabeth, where it is common.

The Blesmol is rusty-brown above, shading to paler at the sides. The head is almost black, with pure white patches around the ear openings, eyes, nostrils and mouth. The body of an adult averages 8 inches.

The typical Mole Rat is *Georychus hottentotus*. It is uniform dark slaty in colour without any vestige of white.

The fur in most species has a rusty tinge.

It is common in the eastern parts of the Cape Province, extending from Stellenbosch in the west, to Natal on the east.

There is another species or kind known as Darling's Blesmol (*Georychus darlingi*) which is the same size and colour as the former, but it can at once be distinguished by the patch of pure white fur which is present on the top of its head.

When ploughing or digging up land with a spade or hoe these destructive rodents are often unearthed, as well as the little insect-eating Golden Mole. The gardener and farmer, as a general rule, do not know one from the other, and regarding both as vermin they are destroyed. If the farmer knew a little of the Natural History of his country, and made an intelligent study of the various creatures in his neighbourhood, he would know, for instance, that the Golden Mole is a friend and ally, and that the Blesmol and Mole Rat are pests in cultivated lands.

The Blesmol and Mole Rat are undoubtedly destructive in cultivated fields, as their diet consists entirely of roots, bulbs, tubers and the stalks of growing crops. They are especially destructive in potato fields.

They possess voracious appetites, and devour a considerable amount of provender on the spot, and carry quantities away to their storehouses underground. Like the porcupine, they spoil more than they actually devour by their habit of gnawing a small portion of the substance and discarding the remainder, which rapidly rots. In this way a few of these mole-like rodent animals will do extensive damage in a potato field.

The Blesmols, Mole Rats and Sand Moles are classified in the family *Bathyergidæ* and are divided into two genera, viz. *Bathyergus* and *Georychus*.

Their bodies are wonderfully adapted to their underground mode of life. Like the Golden Moles, the ancestors of these mole-like animals enjoyed life above ground, but changing conditions of climate, and an increase in the number of their natural enemies, impelled them to seek sanctuary underground, until in course of time the habit was established, and in consequence their bodies became adapted to the new life. The eyes being no longer necessary in the case of the Mole in its subterranean existence, became rudimentary, and are now but the veriest vestiges; and the tail being a hindrance, vanished. In the true Mole of Europe the stump still remains.

Mounds or hills cast up by the Blesmol. The Blesmol, Mole Rat, and Sand Mole are Nature's ploughmen. These rodents are useful in uncultivated lands, but are a curse in cultivated fields.

Albino Mole Rat from a garden in Port Elizabeth. The normal colour is slaty-grey with a rusty tinge.

The Blesmols and Mole Rats possess eyes, but they are very small, and the vision is exceedingly limited. The tail has almost vanished, being represented by a short stump, covered with hair.

These animals are wonderful examples of how the various parts of the body become modified to suit the changing conditions or habits of life. It is easy to understand that with increased use a part will develop, and another through lack of use will become atrophied; but we cannot advance a reason why each and every part of the body grows and shapes itself in such a way that it becomes a perfect instrument for the purpose for which it is intended; nor what it is that determines the protective coloration of plants, insects and animals.

It is futile for any man to argue that the evolution of life is a matter of blind chance, and that in the struggle the fittest survive. Granted the fittest, mentally and physically, do survive; the study of life upon this planet nevertheless makes it clear that there is a moulding, fashioning, purposeful Intelligence at the back of it all, and that intelligent, mysterious Power or Force we humbly and reverentially bow to and know as God the Creator.

Mole Rats and Blesmols of one species or another occur in all parts of South Africa, and even in the centre of the Kalahari Desert, where their mounds may be found at least a hundred miles from water.

There are several methods by which the Blesmol and Mole Rat may be destroyed. Carefully remove

the freshest "hill" and expose the hole. Pour down this hole a few ounces of carbon-bisulphide, and stop up the hole with mud. The chemical will evaporate, and the gas, being heavy, will travel along the tunnels and suffocate the inhabitants. Carbon-bisulphide is highly inflammable.

A second method is to inject a potato tuber with strychnine, and insert it into a fresh burrow. Instead of injecting the tuber, a wedge-shaped piece may be cut out, strychnine laid in the cut, and the wedge replaced.

A third way is to pour water down their burrows and drown them; an abundance of water, however, is usually needed.

Still another way is to open up the burrow by clearing away the freshest "hill," scoop out a hollow on the floor of the burrow, set a trap in it, concealing the trap by dusting loose soil over it. The burrow is then closed by placing a small bit of leafy bush over it, and covering with soil. The owner of the burrow, anon, comes along to investigate, and gets caught in the trap. Baiting the trap with a small potato tuber or carrot is often effective.

The Blesmol is sometimes shot. To do so the newest mound is cleared, leaving just sufficient damp soil to cover thinly the mouth of the tunnel. A piece of leafy bush is then put over the hole and some soil laid lightly over it, to exclude all light from the hole. Retiring a few paces, the watcher must sit silently with a shot gun until the Blesmol returns

The Springhare which devours the crops of the farmer during the hours of darkness. [See page 158]

Skeleton of a Springhare.
From a specimen in the Port Elizabeth Museum.

with a fresh quantity of soil and begins to push it up. When it is well up, the head of the animal will be above the level of the ground, and a charge of shot fired into the moving soil will usually be effective in killing the animal. Bright moonlight nights are the best times for this operation.

These mole-like rodent animals are grouped under two genera, and the genus to which the various species belong, may at once be determined as follows :

Genus : *Bathyergus*

SAND MOLES

Toes of the fore-feet with long and strong claws, the claw on the second toe being considerably longer than the rest. On the hind-feet the claw on the third toe is the longest. Upper incisor teeth *grooved.*

Genus : *Georychus*

BLESMOLS AND MOLE RATS

The animals under this genus are smaller in size than those of the preceding genus, but closely resemble them externally. They differ chiefly as follows :

(1) The claws of both fore- and hind-feet are small. The claws of the second and third toes of both fore- and hind-feet are the longest.

(2) Upper incisor teeth *ungrooved.*

THE SPRINGHARE OR SPRINGHAAS

Also known as the Jumping Hare.

(*Pedetes caffer*)

Inziponde of Amaxosa.

The Springhare, although so similar in outward shape to the members of the Kangaroo tribe, is not related to these marsupial animals, being far removed from them in classification; but, although so kangaroo-like in shape, its nearest relatives are the Porcupines, Blesmols, Rats and other rodent animals.

A glance at the curved front or incisor teeth of the Springhare satisfies the naturalist that it is a member of the great order of gnawing animals termed Rodents.

The Springhare is common from the south coast of the Cape Province, northwards as far as the Equator on the east, and Angola on the west. In the southern portions of Natal, however, it does not occur.

In most parts of the midlands of the Cape Province it is very common, and even in the vicinity of Port Elizabeth it is met with.

It is sociable in its habits, and forms an intricate series of burrows in which a good many families

take up their abode. It frequents the mountainous country, valleys and veld, and selects those localities where the rainfall is not abundant, and there are many such in South Africa.

It seldom wanders any great distance from its burrow, towards which it instantly races in a series of hops or long jumps on the slightest alarm.

Although its hind limbs are tremendously developed, and the muscles of the thighs very large, yet the Springhaas is not a swift runner, and if surprised far from its burrow can easily be run down by dogs.

When wandering about at its leisure seeking food, it proceeds on all fours with short hops, after the manner of a rabbit or hare ; but unlike the graceful movements of the latter, it hops in a most ungainly-looking way, owing to its disproportionately long hind limbs.

However, when alarmed and travelling at full speed, it races along after the manner of a kangaroo, with great bounds, each leap covering 8 or 9 feet. When seen thus in swift motion, with the long bushy tail streaming out behind, the Springhaas is exceedingly graceful and is seen at its best. Owing to its comparatively short fore limbs and long hind-legs, it avoids running down inclines unless forced, and when obliged to do so its progress is slow and unsteady.

Like most rodent animals, the Springhare is timid and easily alarmed, and when feeding it nervously raises itself to its full height on the back legs every

few minutes, after the manner of the kangaroo and wallaby, and carefully surveys its surroundings. It is well for the Springhare that its senses of smell, hearing and sight are so acute, and its cautious faculties so well developed, for its powers of defence against a carnivorous foe are feeble. Animals emerge from their retreats and seek their food at various times during the day or night, according to circumstances. The Springhare, for instance, hides away in its burrow by day and emerges under the cover of darkness, for the reasons that the vegetation is more crisp and juicy at night, and its enemies are fewer and more easily baffled. However, although nocturnal, its foes are many, and it is well for man that they are so, for the Springhare, like most other species of rodent creatures, breeds rapidly, and would doubtless become as great a plague in South Africa as the rabbits have proven in Australia.

The Eagle Owl, of which there are several species in this country, is a dreaded enemy of the Springhare, for these birds, too, are nocturnal. Silently skimming through the air, the Eagle Owl drops upon a Springhare like the fall of a stone, and gripping it in its powerful talons, batters its head with its strong, curved beak until the victim ceases to struggle.

Eagle Owls are particularly destructive to the half-grown and younger Springhares, as these birds unless forced by hunger hesitate before attacking an adult Springhare, for the reason that it is capable of sometimes inflicting severe injuries, and

even totally disabling its feathered foe by the powerful kicks it delivers with its hind-feet, the toes of which are armed with strong, hoof-like nails.

Although more exposed to the attacks of the Eagle Owl out on the hill-sides and veld, the Springhare prefers these situations to bush-covered localities, for it is well aware that the Jackal, and the many species of Wild Cats can, under cover of the bushes, steal upon it unawares. However, so stealthy and silent are the members of the cat tribe that they are able to stalk a Springhare, successfully even out upon the exposed veld. The cat steals up as close as possible, and the instant the Springhare becomes aware of its presence, it bounds off at full speed, but is frequently overtaken by the cat, which makes a rapid sprint after it. Lying in ambush, watching some Springhares feeding on a low hill-side, I became aware of a creature moving not far from me. I lay still, and presently saw that it was a Serval, which is a wild cat of the size of an adult pointer dog. This Serval was stalking the Springhares. It seemed incredible that so large an animal could crouch so low and creep along so silently. With nose held straight out, and body stiffened, it insinuated itself along the ground, taking advantage of every cover. Its tawny colour blended so perfectly with the ground and half-dry herbage, that at times I lost sight of it. When within about thirty yards of the Springhares, I noticed one of them stood up to its full height and seemed to be listening intently. Simultaneously

the cat subsided to the ground and lay still. Presently the Springhare again began to feed, whereupon the stalker crept along. When it had covered another ten yards it evidently realised the impossibility of getting closer without being observed for, with a bound, it cleared several feet, and before the Springhares could even think of flight the cat was in the midst of them, and succeeded in securing one which it instantly carried off into the adjacent thicket. In the past the Leopard and the Chita levied a heavy toll upon the Springhare, but owing to the depredations of these large carnivorous animals among the stock of the farmer, they are hunted down and shot and, although the Leopard is still found sparingly in the wilder parts of the bush country, even of the Cape Province, the Chita has become rare, except in Rhodesia, and will ere long be extinct in South Africa.

The large cats, viz. the Caracal or Lynx (*Felis caracal*) and the Serval or Bush Cat (*Felis serval*) are still plentiful, and prey largely on the Springhare.

There are several species of the Mungoose as well as the Striped Muishond which seek out and devour the Springhare and its progeny, for these animals are of slender form, and are thus enabled to follow the Springhare into its burrow.

In spite, therefore, of this rodent being prolific, it is encompassed around by many enemies, and is not likely to increase unduly in numbers. It even falls a prey occasionally to the ever-watchful Eagle,

of which there are several species in South Africa. In the more secluded parts, away from the habitations of man, the Springhare at times ventures out of its burrow to seek food shortly after sundown. The Eagle returning to its roosting-place after a more or less unsuccessful day's hunting, with its telescopic eyes focussed upon the ground, spies a Springhare feeding. Instantly the Eagle checks its flight, the wings contract, and as swift as a falling stone, it drops with outstretched talons upon its victim, and once within those terrible claws its life is at an end for, if the sharp talons of the bird do not penetrate the vitals of the Springhare and kill it, a stroke or two of the powerful curved beak crushes the skull and, tearing off large pieces of the flesh, the Eagle eagerly gulps them down and flies away to its eyrie with the remainder.

Lying one afternoon in a shady thicket at the foot of a hill, we were dreamily looking across the veld, awaiting the cool of the evening before again starting out on our travels when, within a few yards, we heard a scuffle, and carefully peering through the dense screen of leaves, we saw a Springhare with a Grey Mungoose (*Mungos pulverulentus*) clinging to its thigh. The Mungoose had evidently penetrated the burrow and attacked the Springhare, whereupon the latter made a bid for life by rushing out of its burrow, hoping to shake off the aggressor. However, the Mungoose held on tenaciously, and the Springhare, finding it had not succeeded in its object, instead of

attempting to rush away, seemed to become dazed and ceased to struggle. The Mungoose loosening its grip of the thigh instantly seized its victim by the throat, and soon a red stream denoted that the jugular vein or carotid artery, or both, had been severed. The Mungoose then manfully strove to drag the body to some cover adjacent, fearing lest a rival might dispossess it of its prey. Finding eventually that the body was too heavy to be dragged away, the alert little creature stood high upon its hind-legs and carefully glanced around. A twig cracked under me, and instantly the quick ear of the Mungoose detected it. Up went its head, and for the space of a minute it remained motionless, listening intently and searching every grass tuft and bush with its keen, brilliant eyes. Eventually it seemed assured there was no reason to be alarmed, and it forthwith began to satisfy its hunger, ever and anon raising its head with a jerk and listening intently. However, all its caution availed it nothing, for an eagle from the point of a crag on a krantz some distance away had spied it. Launching itself noiselessly into the air, the bird made a detour, and under cover of the hill, swept right overhead and poised in mid-air. Instantly the Mungoose saw it and recognised a deadly foe. With a grunt of defiance it stood at bay refusing to dash for cover which it could easily have done and escaped, for the momentary poising of the Eagle and the scream it uttered was to frighten off the Mungoose. It had been well for him if his courage

had not been so great, for down came the Eagle with contracted wings, and when within a couple of yards of the ground the pinions shot out and checked its fall. Next instant we saw the Mungoose writhing frantically in the bird's powerful talons. With a discordant scream of triumph the Eagle rose about thirty feet, and presently we saw the body of the plucky little animal drop to the ground with a thud. The Eagle had crushed the life out of it, and disdaining such unpalatable fare as the unsavoury and tough muscular flesh of the Mungoose, had dropped its victim. Within a couple of seconds of the fall of its body, the Eagle alighted by the side of the dead Springhare and, advancing, struck the talons of one foot into it, and with an air of proprietorship, raised its proud head and surveyed the heavens and the earth. Seeing no enemy, it tore large pieces of the flesh from the body and hastily swallowed them. After devouring the flesh of one of the thighs, it seized the remainder and, rising into the air, flew heavily away to the ledge of rock on the side of the krantz from whence it came.

The eyes of the Springhare, like those of many other nocturnal animals, are unusually large. This enlarged eye enables the animal to gather up the feeble rays of night light, and see quite clearly in what to us would be a condition of darkness. It is not only the size of the eye which enables these nocturnal animals to see so well at night. It is because the intricate network of nerves on the retina

of the eye is exceedingly sensitive and responds powerfully to the waves of light, and is thus enabled to register images clearly, which to the eyes of other creatures would be but dim and shadowy.

The young of the Springhare are born during the summer season, and the number at a birth averages three to four, according to Lydekker and Sclater.

However, Mr. John J. Cable, P.O. Erasmus, via Pretoria, Transvaal, writes me as follows: "In Western Transvaal about 500 Springhares were drowned or killed with sticks, after a cloud burst in a large pass which had evidently been dry for years. This was in 1907. We salted down the bodies, and in no single instance did we find a female carrying more than one embryo or fœtus. I was so struck by the circumstance that I questioned the natives who were also busy cutting up the Springhares. They all declared that the female carried only one young at a time."

Mr. Cable is a well-informed naturalist and an accurate observer.

The Springhare is an unqualified pest to man in South Africa for the reason that it is a greedy feeder, and its diet consists of vegetable substances. In consequence it is exceedingly destructive to crops in all stages of growth.

Looking over a farm with the owner one day, I inquired why the mealies were growing in isolated patches. He explained that from the moment the young plants emerged from the ground, the Spring-

hares began devouring them, and the result was that about one-half of the crop was destroyed.

On another occasion I was admiring a ten acre field of beans which had just shot their heads above ground, and unfolded their first pair of leaves to the life-giving light and air. Returning in a week's time, I observed the field was as bare as if it had been ploughed and harrowed the previous day. The Springhares, aided it seems by a few Duiker bucks and hares, had in the interval eaten off every plant. In localities where plenty of water is available, it is an easy matter to capture the Springhare for, if water is poured copiously down the burrow the animal soon emerges, but in most of the localities frequented by these animals the rainfall is scanty, and in consequence no water is available for many miles. Often during the process of flooding the burrows, the Springhares tunnel to the surface and, suddenly breaking the crust, they race off to another hole.

The Hottentot and the pygmy Bushman of the past, however, thought nothing of carrying skin bags filled with water many miles, if there was a reasonable chance of securing a few of these rodents for food. Sometimes a storm of rain sweeps over the localities inhabited by Springhares. After the rain, various hollow spots on the veld are filled with water. These are known as "pans," and as the bottom is composed of clay, the water does not soak away, but remains until evaporated by the sun.

Sometimes these ponds are quite close to some Springhare burrows, and the natives instantly avail themselves of the opportunity of utilising the water for compelling the animals to vacate their burrows.

The European colonist usually encompasses the destruction of the Springhares by shooting them on moonlight nights. Another plan is to take an acetylene lamp, such as those used on bicycles. One man carries the lamp, and at intervals flashes it round in a semicircle as he walks. A friend carries a shot-gun, and holds himself in readiness to shoot. If the brilliant light from the lamp should fall upon a Springhare, its eyes are temporarily blinded with the glare, which prevents it seeing the hunters who are behind the light. It sits up and stares at the light, but the hesitation is usually only momentary, and in that interval the man with the gun must shoot or the Springhare will have vanished into the darkness.

During the game season, which is the winter time in South Africa, large numbers of these Springhares are shot and sent to the various markets. At the Port Elizabeth Produce Market it is a common sight to see a score or more at a time. The flesh is of the same quality as ordinary venison, but with the exception of the enormously developed thighs, there is but little flesh on the body.

The stomach of a Springhare is capacious, and in consequence in a single night the creature can

make away with a considerable quantity of the hard-working farmer's produce.

The weight of a big Springhare is 9½ lbs.

In captivity the Springhare rapidly becomes tame, and is a gentle creature. It will thrive if kept in fairly natural surroundings, or in a roomy cage in which there is a dark, warm retreat in which to sleep, otherwise if forced to endure the light it will pine and die. In a Zoological Garden it should be provided with ample space, and an incline should be provided, up which it can run at intervals for exercise.

When sleeping the Springhare sits on its haunches, crouched up, with its fore-paws and head between its thighs. The tail, which is long and bushy, is lapped round the front of the head. There are only two species of Springhares. The one which naturalists know as *Pedetes caffer* is the only kind found in South Africa. It differs slightly according to the part of the country it inhabits, and to distinguish these local varieties, of which there are two, naturalists have divided it into the typical kind and two sub-species.

The second species is known as the Eastern Jumping Hare (*Pedetes surdaster*) which inhabits East Africa north of the Zambesi.

THE OCTODONT TRIBE

Family: Octodontidæ

The rodent animals of this family are more or less rat-like in form, and are distinguished from the rodents of other families by having completed collar bones, and the crowns of the molar teeth being marked by folds of enamel on both sides.

There are usually five toes to each of the fore- and hind-feet, and the teats are situated high up on the body.

The majority of the species of the Octodont tribe inhabit South and Central America and the West Indies. Two species inhabit South Africa, one on the west and the other on the east.

Genus: *Petromys*

There is only one species in this genus. Tail only slightly shorter than the head and body, covered with rather long hairs; incisor teeth compressed, small and ungrooved.

THE ROCK RAT OR NOKI

(*Petromys typicus*)

The Rock Rat is an inhabitant of Namaqualand, and has its home in the holes and crevices amongst

the rocks of the arid, rocky mountain ranges. It may be seen at any time of the day running about over and amongst the boulders, or lying basking in the rays of the sun.

It feeds upon the stunted vegetation which struggles for existence amongst the rocks, such, for instance, as the flowers of some of the *Compositæ* which grow rather profusely in these dry, rocky localities.

The Rock Rat shows little natural fear of man, and is easily tamed, and makes an interesting pet.

The head and body of this rat averages 6 inches in length. The tail is slightly shorter than the head and body.

General colour of the upper parts grey with a shade of brown, and pencillings of tawny and black; the posterior part of the back and the hind-legs dull chestnut, the hairs being grey with a bluish tinge at the base.

Ears wider than high, and rather small and dark in colour; under parts shabby white with a tawny tinge. The front limbs have four toes armed with claws, the first toe being rudimentary and represented by a tubercle only. Incisor teeth small and smooth.

Genus: *Thryonomys*

Body covered with short, stiff bristles; tail less than half the length of the head and body; incisor teeth broad and strong, the upper ones with three deep grooves.

There are several species in this genus, all of which inhabit Africa from the Cape, northwards through Central Africa, both east and west to the Upper Nile regions.

Only one species inhabits South Africa.

THE CANE RAT

(*Thryonomys swinderenianus*)

The Cane Rat inhabits the fertile eastern parts of South Africa, from the Eastern portion of the Cape Province, up through Natal, Zululand, the Eastern Transvaal, and northwards to Tropical Africa.

The name Cane Rat has been given to this animal on account of its partiality for sugar-cane plantations, and the rat-like shape of its body.

The typical rat's only claim to relationship, however, with this animal, is the fact of its being a member of the great gnawing tribe of animals known as Rodents.

The Cane Rat inhabits dense undergrowth, thick scrub, long rank grass, reed beds, and sugar-cane plantations.

Its food consists of roots, bark, tender shoots, the pith of rushes, and various soft plants.

This animal is exceedingly destructive to crops of almost every kind. Issuing forth during the hours of darkness from its lair, it invades the cultivated fields. I have seen acres of pumpkins and melons

destroyed by these animals. It is not exactly the numbers of pumpkins the Cane Rats actually devour that the farmer complains of; it is their habit of sampling them in a wholesale manner with the object of finding a nice sweet ripe one on which to make a meal.

These Cane Rats are very fond of mealies, especially when in the soft milky condition of development. To secure the corn cobs, the mealie stalk is gnawed through and falls to the ground.

In fields of corn and millet they have regular beaten tracks running at various angles from their lairs in the neighbouring thickets, wooded kloofs, long grass, or reed beds.

The Cane Rat is very destructive in sugar-cane plantations, and is regarded as the planter's worst enemy. With its powerful chisel-like incisor teeth it gnaws through the stalks of cane, destroying infinitely more than it eats. These sugar-cane plantations are vast masses of cane plants growing so closely together that they afford the finest possible cover for rodent animals such as the Cane Rats. When the cane is tall enough to afford shelter, the Cane Rats invade it from the neighbouring thickets and other harbouring places, and make their home in the midst of it, feeding nightly upon the sweet pith. Here they dwell until the cane is cut down, when they once again retire to their native haunts.

In situations which afford ample cover in the shape of cane fields, reed and rush beds, thorny

scrub and undergrowth, the Cane Rat forms a soft nest of shredded grasses, plants, etc., on the ground, in the most sheltered place obtainable. Here a litter of from two to four young are born. Breeding takes place during the spring and early summer.

It is stated that this animal is not a burrower. On the contrary, in localities which do not afford a sufficiency of cover, the Cane Rat forms shallow burrows, invariably on sparsely-wooded, sloping ground. In these burrows they seek shelter during the day, and when the time for breeding arrives, the female rears her little family in a nest in a chamber at the bottom of the hole. In Natal, in the district of Pietermaritzburg, I frequently hunted these Cane Rats, and on several occasions my terriers tracked them to burrows which were always on the slope of a hill sparsely covered with bush. The burrow is sufficiently large for a fox-terrier to enter. Sometimes a terrier would drag several from a single burrow. On one occasion an adult female and four others, half-grown, were dragged forth, one by one. These half-grown Cane Rats were evidently the last litter. Sometimes the deserted hole of an Aard Verk would be taken possession of, and in these holes we have secured a dozen and more Cane Rats at a time. As a general rule, however, this animal does not burrow, but contents itself with the cover afforded by the tangled masses of scrub, vast beds of reeds, long matted grass, etc. In these lairs it has regular beaten tracks running in all directions. The

only dogs with which I could successfully hunt the Cane Rats in these situations were fox-terriers which, owing to their small size, were able to traverse their beaten tracks.

The Cane Rat is often hunted on moonlight nights with dogs, when it is out foraging for food in the farmer's cultivated fields. When surprised away from its lair it falls an easy prey, for it is not a swift runner, and a single nip from a dog will kill it.

The natives regard the Cane Rat as a choice article of food, and in consequence it is constantly hunted by them with dogs. A Kafir will regard himself as being amply repaid if, after a whole afternoon's hunt, he secures a single Cane Rat.

The flesh of the Cane Rat is soft, tender and very palatable, and affords an excellent article of diet. It is, like the hare and rabbit, purely a vegetable feeder, and therefore there need be no scruple about partaking of the meat. The Cane Rat could, with advantage, be domesticated and bred as a food animal, for its flesh is equal to that of the partridge and pheasant, and much superior to that of the hare and rabbit. When prepared for cooking, the body is dipped into boiling water for a moment or two, and the bristles are then scraped off with a blunt knife.

The Cane Rat is covered with coarse bristles which can be plucked out very easily. The skin itself is peculiar in its nature; it is not elastic, and consequently tears easily.

In skinning and mounting these animals the great-

est care must be exercised, otherwise the skin gives way. Special care has to be taken when sewing up the specimens, as the slightest straining of the thread will cause the skin to rip. The two sides should be held together and carefully sewn.

The enamel on the incisor teeth of the Cane Rat is very hard, and the teeth themselves are so stout that even an elephant's tusk can be gnawed into.

The chief natural enemies of the Cane Rat are the Striped Muishond or Pole Cat, the Snake Muishond or Weasel, the Mungoose, Wild Cat, and Python. The latter is of the utmost possible value to the sugar planter. The cane brakes afford an ideal home and hunting ground for the Python, and when there are any of these reptiles in the neighbourhood, they come out of their native haunts and dwell in the midst of the cane plantations, and relentlessly hunt down the destructive Cane Rat, which is swallowed whole. The Python lies concealed in close proximity to one of the tracks of the Cane Rats, and the instant one of these animals runs past, the snake, swift as an arrow from a bow, darts its head at the animal, and once it fastens its jaws, armed with sharp, recurved teeth upon its victim, it is doomed. When swallowed, the entire body of the Cane Rat is digested, including the bones. The bristles only are excreted.

The Python, often erroneously termed a Boa Constrictor, is non-venomous, and in spite of its huge size, is a most inoffensive reptile. However,

The Rock Rat or Noki (*Petromys typicus*) which lives among the rocks of the arid mountain ranges of Namaqualand.

From a painting by Sir Andrew Smith.

The Cane Rat emerges from its lair at night to ravage the sugar-cane plantations and the crops of the farmer. It is as big as an adult hare or rabbit.

so great is the antipathy of the average man to snakes, that he shows the Python no mercy, notwithstanding the fact of it rendering him the most valuable of services.

Major J. Stevenson-Hamilton in his most excellent work *Animal Life in Africa* states that the Amatshangana tribe of natives have a rather curious superstition regarding the tail of the Cane Rat. This appendage is carefully cut off and cast away before the village is reached, for a married woman must on no account be allowed to behold it.

The Cane Rat, once seen, cannot easily be mistaken for any other animal.

The head and body of an adult averages 20 inches, and the tail about 7 inches.

It is robustly built and attains a weight of twelve pounds, and occasionally fourteen pounds.

The body is destitute of fur, and is covered with coarse bristles. These bristles are light brown at their bases, and for the greater part of their length, with a subterminal black ring, and dull yellow at the tips, giving the animal a yellowish-brown appearance. On examination the bristles will be noticed to be flattened and grooved on their upper surfaces. The ears are short, round, and barely visible amongst the bristles. The upper lip and chin are dull white; fore limbs shorter than the back ones. Tail scaly and sparsely covered with short, stiff hairs. Incisor teeth broad and strong; three deep grooves in those of the upper jaw.

THE SOUTH AFRICAN PORCUPINE

(Hystrix africæ-australis)

Mcanda of Amaxosa; Ingungumbane of Zulus; Nunku of Basuto.

The South African Porcupine is widespread in South Africa, and ranges as far north as Central Africa.

Among the many remarkable-looking animals of the world, it stands out prominently by reason of its peculiar armament of long and sharp quills with which its back and sides are studded. These are sharp-pointed, and constitute the animal's sole means of defence against its many enemies. All the carnivorous animals of the country seek to devour it, but few are daring enough to attack so formidable an opponent.

On the slightest alarm it instantly races away for home, which is a burrow excavated by itself, or a deep cleft in the rocks on some adjacent stony hill. These rock shelters are always preferred for the reason that they are invariably cosy and dry, and afford a securer protection than a burrow on the hill-side or veld. The lairs in the rock crevices are usually considerably improved by the animal, which deepens them, and scrapes out all loose earth and stones. Sometimes a deep burrow is tunnelled beneath an overhanging ledge or boulder. Should the

Porcupine find itself overtaken or cut off from its lair, it instantly faces its foe, and seeks to intimidate it by violently stamping its feet and rattling its quills, especially the short hollow ones that constitute its tail, and which make a noise like the rattling of peas in a dry bladder.

Should this not succeed, and the foe be some carnivorous animal, it wheels round and takes the enemy completely by surprise by rushing in at it backwards; and should the aggressor not be exceedingly alert, it will be impaled by half a score or more of sharp quills. The Porcupine has the power of elevating its armament of quills at will, so that they stand straight out from the body. When on the defensive the quills are raised, and the head drawn in between the fore-legs. It stands thus on the alert, keenly watching every movement of the enemy. Should a favourable opportunity of attack present itself, the Porcupine instantly avails itself of it. The animal has considerable driving power at the back of its quills, although it is quite incapable of actually discharging them to a distance, as is popularly supposed.

When it makes its charge, the moment it gets within quill length of the enemy, it distends its body, and in this way forces the needle-like points of the quills deep into the flesh of its foe.

In hunting Porcupines, dogs are frequently killed or severely injured. I have known several instances of them being blinded in both eyes by the quills.

However, dogs soon learn to be careful, and confine themselves to keeping the quarry at bay till the arrival of their master.

The Porcupine is often hunted by men armed with sticks or spears—on bright moonlight nights—with the assistance of dogs. This is a very exciting pastime, for the hunter must be keenly on the alert to spring aside should a Porcupine make a sudden dash backwards. Often the animal makes a straight forward charge, and should the hunters legs be apart, it darts between them, and as it passes, the quills are driven an inch or more into the calves. These quills are loosely attached to the skin of the animal, and very easily come out. Those which are lost are soon replaced by others which grow from the same sockets.

On one occasion I was present when a farmer received seven quills in the calf of the leg. The Porcupine made an unexpected dash at him. He thrust at it with his spear but missed, and next instant it swept past his leg, leaving the quills imbedded deep in the flesh. It required considerable force by pulling with both hands to withdraw them.

Previous to the advent of man into South Africa, the Leopard was one of the chief enemies of the Porcupine. By its great agility it avoided the sudden rushes of the animal, seeking an opportunity to deliver a blow on the nose or head with its heavy paw, which either stunned or killed it, for the bones of the skull of a Porcupine are thin and easily frac-

tured. However, the Leopard did not always come off victorious, and at times was glad to slink off and leave its intended enemy at peace. A hunter related to me how he once came across a Leopard which apparently was in dire distress. He shot it, and on approaching, noticed that its cheek and lips were very much lacerated in its endeavours to remove several strong porcupine quills which were firmly embedded in its tongue and cheeks. Three were sticking in the roof of its mouth, thus preventing the tortured creature from closing its jaws. It had evidently attacked a Porcupine, and being rash or inexperienced, sought to seize it in its jaws, with the above frightful result. From the appearance of the mouth, the Leopard had been in this condition two or three days. Its sufferings must have been appalling.

On another occasion a Leopard was shot, and it was noticed that one of its paws was in a crippled state. On examination a portion of a porcupine quill was seen to be deeply imbedded in its foot. The whole paw was in a swollen and highly inflamed condition.

Young lions often attack the Porcupine and retire from the conflict with feet pierced by the sharp spines which break off, leaving their points imbedded firmly in the pads of the aggressor. The spines set up inflammation, and the paws of the Lion become a mass of suppurating sores, which so severely cripple the animal that it slowly dies of starvation. Even

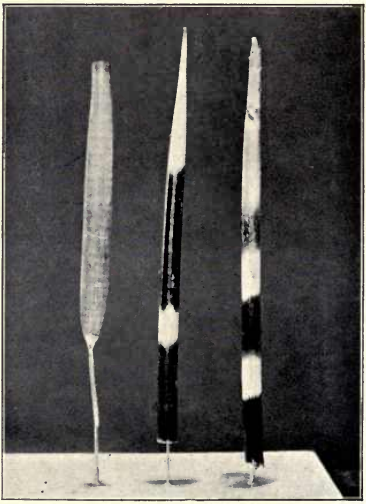
adult lions are at times reckless enough to attack Porcupines, for various hunters have mentioned having killed fully adult lions in almost the last stages of emaciation, whose paws were masses of horrible discharging sores from the presence of porcupine quills.

Major J. Stevenson-Hamilton relates an instance of an adult Lion which sprang upon a pack horse, but so weak was he that the horse threw him off with ease. When shot this Lion was found to be almost in the skeleton condition, and his feet in a dreadful state as the result of the presence of porcupine quills. The quills do not always cause suppuration. I have found quills embedded in lions' paws, jaws and lips with the flesh healed up all round and over them.

Porcupines may be safely classed as vermin for, from a human point of view, they are almost without any redeeming quality. In death the quills are useful, and the flesh is tender and palatable. Alive, they are interesting specimens in Zoological Gardens, but at large they cause considerable damage.

The Porcupine is a rodent or gnawing class of animal, and its diet is of a vegetable nature. Out in the wilds, away from the habitations of man, its food consists mainly of roots, bulbs and tubers which it digs up. Nothing of an edible nature in the vegetable world comes amiss to it. Should a farmer's garden be within reach, it abandons its ordinary food and, visiting his fields in the silent

The South African Porcupine is a pest to the agriculturalist, and a friend to the stock farmer.



South African Porcupine. 1. A white hollow quill from the tail. 2. Portion of a body quill shewing the sharp end. 3. The same, shewing the end which is loosely embedded in the skin.

hours of the night, digs up and devours his root crops, and levies toll upon anything eatable of a vegetable nature above the ground. In the pumpkin and melon fields, the Porcupine plays havoc, for it is not content to satisfy its appetite on one pumpkin or melon, but in a single night it may sample a score, and all those which are thus injured rapidly decay. The mealie cob being out of its reach, the stem is gnawed through and the cob falls to the ground.

If the cob should not be to its liking, it will gnaw the stems of several mealies and sample them all. Like the monkey tribe, when food is plentiful the Porcupine is exceedingly wasteful.

A Porcupine is a bulky animal of about half the size of an adult domestic pig. The legs are short, and the body cylindrical.

The appetite of a Porcupine is enormous, and the destruction wrought in cultivated fields by a few of these animals is considerable, and for this reason the Porcupine is hunted down and killed on every available occasion. In South Africa, in spite of the hand of nearly every man being against it, the Porcupine is still fairly plentiful.

Porcupines, however, are not an unqualified pest to man. They dig up and eat the tulips that are highly poisonous to cattle, and which gradually destroy the grass on the veld; they devour the melkbosch, wild onion and aloe, all of which are either poisonous to stock or encumber the land and retard the growth of food plants. In the thorny mimosa

forests and bush-veld the Porcupine does great service in digging up the young trees to feed on their roots. On Mr. Louis Walton's farm at Mimosa, the Porcupines thus prevent the thorny mimosa from overspreading the land, and converting it into an impenetrable bush. Undoubtedly in these mimosa-infested lands the Porcupine is of great economic value. In consequence of its valuable services on Mr. L. Walton's extensive farm, it is held sacred by him, although it takes a toll of his mealies when they are ripening. I have visited the farm and witnessed the good work which the Porcupine accomplishes.

It will therefore be seen that although a pest to the agriculturalist, it frequently proves a valuable ally to the stock farmer.

The incisor teeth, of which there are two in each jaw, are large and powerful, and the animal, in consequence, possesses considerable gnawing powers.

The young are born in a nest at the end of a burrow, or in the innermost recesses of a lair in a rock cavity. The nest is composed of dry grass, leaves, moss and roots torn to shreds. Three or four young are the usual number at a birth. When born the eyes are already open, and the body covered with soft spines. These spines, on exposure to the air, soon harden. When large enough to venture forth, the young accompany the mother on her quests for food. When alarmed the mother often takes one of her youngsters on her back and makes off with it. Mr. Loton Tipper made a lunge with a spear at a Porcu-

pine one night, and knocked off a young one which was clinging to its parent's shoulder.

The quills of the Porcupine vary in length, those on the back being longest. They are glossy and ringed alternately black and white. The tail is most peculiar. It consists of about a dozen hollow, semi-opaque quills, which in the adult are open at the end. Each of these hollow quills is attached to the animal's skin by a strong, hard ligament, like cat-gut. When shaken, the quills rattle against each other. They are sounded as a signal of danger, and also with the object of intimidating an enemy.

The South African Porcupine is the sole representative of its kind in this country. There are, however, a large number of species inhabiting other countries. Porcupines are divided into two families. Those which inhabit North and South America are all included in the family *Erithizontidæ*. These are four in number: the Canadian Porcupine, and three South American species, viz. the Brazilian Porcupine, the Mexican Porcupine, and the Thin-spined Porcupine. The three latter species are true Tree Porcupines, for they possess prehensile tails and live aloft in trees. The Canadian Porcupine, although it spends most of its time among the branches of trees, does not possess a prehensile tail.

All the ground-dwelling Porcupines inhabit the Old World (Europe and Asia), and are grouped in the family *Hystricidæ*. There are a considerable number of species, one of which inhabits Southern

Europe, and the northern parts of Africa, and is known as the European Porcupine. Another which is known as the Brush-tailed Porcupine occurs in West Africa; and yet another species of the Brush-tailed kind is found in Borneo. All the other species or kinds, with the exception of the South African Porcupine, inhabit Asia and adjacent Islands.

Albino Porcupines are occasionally met with in South Africa.

A South African Porcupine emerging from its hole at the base of a krantz.

Tail of a Porcupine. It consists of a bunch of hollow quills, open at the ends. When alarmed it rattles them as a danger signal to its compatriots.

HARES AND RABBITS

The Hares and Rabbits are rodent or gnawing animals, distinguished from others of the great Rodent Order by the presence of two pairs of incisor or front teeth in the upper jaw. The inner pair are very small and lie behind the outer ones. Three pairs of pre-molar teeth are present in the upper, and two in the lower jaw.

The fur is usually grey, tinged with rufous; tail stumpy and upturned; ears long; fore limbs short and furnished with five toes; hind limbs long and with four toes. Feet densely covered with hair above and below. The inner sides of the cheeks have a hairy covering.

The Hares and Rabbits are cosmopolitan in their range, with the exception of Madagascar and Australia. In the latter continent they were introduced, and owing to the absence of carnivorous animals and large birds of prey to keep them in check, they have multiplied vastly, and are a source of great financial loss to the farmers.

All the Hares and Rabbits are grouped in one family (*Leporidæ*), and until lately all the species were in one genus (*Lepus*). Recently, however, a rabbit totally different from any of the others was

discovered on the slopes of Mount Popocatepetl in Mexico. It differs chiefly from the typical Hares and Rabbits in having no visible tail, short ears and comparatively short hind limbs.

There are also two species of mountain-dwelling hares in South Africa which have been placed under another genus, viz. *Pronolagus*, which now makes three genera of hares.

The great majority of the species of Hares and Rabbits inhabit the open grass and herbage-covered parts of the country, and the rocky hills. These animals, without exception, are extremely timid in disposition.

The Rabbit differs in many ways from the true hare. It is, in most instances, of smaller size, the ears, hind-legs and feet are shorter, and the colour of the fur is greyer than that of the Hares.

The Hares produce their young fully clothed with fur, and with their eyes open; whereas the young of the true Rabbit are born naked, blind and helpless.

The flesh of the Hare is red, and that of the Rabbit is white. There are no true rabbits in South Africa, although one species is rabbit-like in form.

Hares and Rabbits are adult at the age of about six months, and are capable of reproducing their kind at that age. They are all highly prolific, and when their natural enemies are reduced below normal, they soon become a plague to man.

THE CAPE HARE

(*Lepus capensis*)

This is the typical Hare of the veld in South Africa, and is known to the colonists as the Vlackte-haas or Hare of the plains. It is called Mukla by the Basutos, Umvundhla by the Amaxosa, and Nogwaji by the Zulus and Swazis. The Cape Hare inhabits the veld and low hill-sides of Africa from the Cape to the Equator.

It is nocturnal and solitary by habit for, except at the breeding season, the sexes do not associate.

The female annually produces several litters of "leverets," as the young are termed. From two to five are brought forth at a birth. Two or three seems to be the usual number. The leverets are born with bodies covered with fur, and their eyes open. The mother suckles them for about a month, and they then wander off and lead an existence independent of her. This is a wise provision of Nature, for the Hare does not construct burrows. The young are born out on the veld, and their only shelter is the grass and low shrubs.

From the day of their birth the young hares are adepts at concealing themselves from their enemies. On the slightest cause for alarm they dart for cover, and squat upon the ground with body bunched up and ears lying flat against the neck. So closely

does the colour of their fur blend with the surroundings that, when sitting immovable, they are exceedingly hard to find.

Many a time on pebbly ground I have surprised baby hares during the early hours of the morning, or about sunset, or on dull, cloudy days, but without the aid of good dogs I could rarely find them. The instant I came upon the scene I would catch a momentary glimpse of two or three little grey balls of fur and small, white, upturned tails, and the vision would vanish—the little creatures had suddenly squatted, relying upon their resemblance to the stones and earth around them to escape observation.

It is not often, however, that the leverets venture into open spaces for, being too young to escape by flight, their only means of escape from their enemies is by concealment.

The Secretary Bird is accused by sportsmen of destroying young hares, and is often shot at sight in consequence. The number of young hares devoured by Secretary Birds is not by any means large. This I know from the examination of the crops of scores of these birds. It must be borne in mind that the young hares usually lie concealed from view under thick tufts of grass and low, dense bushes during the daylight hours when the Secretary Bird is on the prowl, and that it hunts by sight only. In any case hares are vermin as far as man is concerned.

The Hare during the daytime lies concealed in a lair which is known as a "form." This consists of a slight depression in the soil under a tussock of grass, or small bush; or in the midst of scrubby bush, if grass and small shrubs are scanty. Sometimes it lies concealed on the shady and sheltered side of a boulder on the bare ground.

When sitting immovable in its "form," amidst half-dry grass or dead leaves, the Hare may easily be passed unnoticed within a foot or two, although it might be in full view.

It takes the fullest advantage of its protective coloration as a means of defence, for the Hare usually lies so close that it will almost allow itself to be trodden upon before taking to flight. Advantage is sometimes taken of this habit to capture hares alive by throwing a net over them. On several occasions I have attempted to catch hares with my hands when they were sitting immovable, but although not a movement was made to attract attention, the Hare was wide awake all the time closely watching very movement, and at the critical moment it leapt away and bounded off with remarkable swiftness. Even when lying on absolutely bare ground, the Hare will often sit immovable and allow itself to be almost walked over.

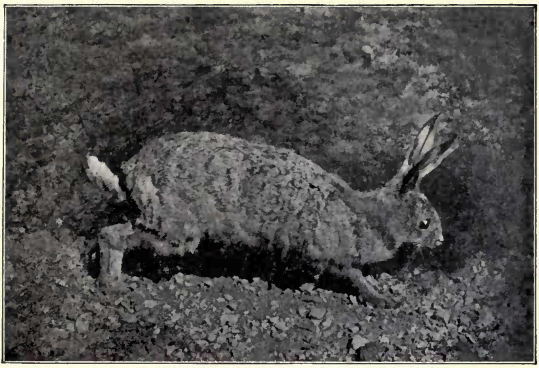
One day my pointer dog came upon a Hare on the bare ground in a plantation of gum trees. The dog approached to within three feet of the animal

and stood rigid, as is their habit when well trained. The eyes of the Hare were wide open, and being large and prominent, and on the sides of the head, it had a clear view of the dog behind. I stood at a short distance and watched for fully fifteen minutes, and it was not until I finally gave the signal for my dog to rush at it, that the Hare resorted to flight.

The Hare is nocturnal by habit. It sits in its "form" or lair by day, and issues forth at dusk and feeds during the night, retiring again at sunrise to the same lair, if undisturbed. If alarmed it seeks another resting place at a distance. It feeds upon grass, and a large variety of other plants, and may often be seen on country roads at early dawn and moonlight nights, feeding on the grass bordering the roadways.

When cycling or motoring at night along country roads, hares are frequently seen in the glare cast by the acetylene or electric lamps. In fact they are frequently hunted in these ways. When the glare of light falls upon them, instead of instantly vanishing into the herbage bordering the roads, the hares usually pause for a few moments to gaze at the light, actuated by curiosity and bewilderment, and are in consequence easily shot.

Hares do considerable damage in cultivated fields by eating off the young plants. The number of seedling plants a single Hare is able to devour in a night is immense, and unfortunately when such succulent and tender fare is forthcoming, these



The Cape Hare or Vlackte-haas (*Lepus capensis*) of the open veld.

The South African Hare or Kol-haas (*Lepus saxatilis*) of the bush-veld.

rodents become a serious menace to the agriculturalist.

The Cape Hare often develops unclean habits of feeding, and frequents roads, Kafir and cattle kraals to feed upon animal and human excrement. However, most species of rodent animals are apt at times to devour loathsome substances.

Hares sometimes do great harm in young plantations by gnawing away the bark of the trees.

During rainy weather these animals usually desert the open veld and seek the welcome cover of patches of scrub, the sheltered sides of rocks, and overhanging banks.

The Hare is a good swimmer, and will plunge into a river and swim across when pursued by dogs, or to secure better food or a mate. There is an instance on record of a Hare actually swimming over an inlet of the sea, a distance of more than a mile.

The Hare is an exceedingly timid animal, and utterly lacks defensive weapons in the way of fighting-teeth, claws, or an offensive secretion. It is, however, well compensated, as the colour of its fur is highly protective, its speed is great, its hearing is exceedingly keen, and it is endowed with much cunning.

When a Hare hears any suspicious sound, it raises itself erect on its hind-legs, and listens intently. If its suspicions are justified it quietly steals into cover, takes to flight, or instantly squats flat upon the ground, every sense keenly on the alert. When

pursued by greyhounds, the Hare frequently succeeds in evading capture by its remarkable power of making swift turning movements to left or right, which baffle the dogs, owing to their inability to turn rapidly when running at full speed.

The various species of carnivorous animals and birds of prey are the Hare's chief enemies. The majority of the former lie in ambush and spring out upon the Hare, or, owing to their powers of scent, they are able to discover and devour the leverets before they have developed powers of flight.

Sitting under a bush, I watched a large Blue Hawk with coral red legs, known as the Chanting Goshawk (*Melierax conorus*), flying low and carefully inspecting the ground. Suddenly he fell like a stone, and a Hare bounded from the grass on the spot the Hawk dropped on. Flying low the Goshawk continued to beat down on the distressed Hare until the poor creature was overcome.

In South Africa the Eagle Owl levies a considerable toll on hares; and amongst animals the Striped Muishond (*Ictonyx capensis*) is an implacable foe to the Hare. It is a slow-moving animal, but its powers of scent are so keen that it is able to track the Hare like a bloodhound. The Hare when startled by a Muishond, bounds off at full speed, but finding its foe is not apparently following, it soon slackens its pace and begins feeding again. The Muishond, however, is upon its track, and

with tail switched over its back it jogs along at a trot and once more surprises the Hare, which, now thoroughly alarmed, bounds off, perhaps for a mile or more. Time and again the plodding Muishond tracks it down, until the Hare is either exhausted or so terrified that it makes no further attempt to escape, whereupon the Muishond grips it by the throat and ends its existence.

One morning just after dawn, when riding across a hill-side, I observed a Hare break from the grass at some distance below on the veld. It ran for a short distance obliquely up the hill, and slackening its pace began to hop about at random in an aimless kind of way. Its actions were so unusual that I dismounted and watched it. Presently a Striped Muishond, with tail aloft and nose to the ground, came into view from the spot where the Hare appeared. It had evidently been most of the night on the trail of the Hare, and the latter was, no doubt, exhausted and dazed with fear. When it observed its enemy, instead of making another bolt for life, it threw itself upon its side and screamed shrilly, until the Muishond tore out its throat.

On another occasion I was fortunate enough to observe another more or less similar tragedy of the veld.

It was about sundown out upon a low hill-side. I was lying behind a boulder watching some Klip Dassies or Rock Rabbits with the aid of a field-glass, when I observed the well-known form of a Striped

Muishond, which, by the way, is known to many as a Polecat. It was trotting along with its nose held high. Presently it became more cautious in its movements, and depressing its head, elongating its body and thrusting its tail out behind, it stealthily approached a clump of grass in which a small shrub was struggling for existence. Pausing for a second, it darted into the herbage, and on the instant a Hare shot forth and bounded off at full speed and passed within a few paces of me, with the Muishond hanging on to its side, and its body bumping along over the ground. After racing for about a hundred paces, the Hare stretched itself upon the ground and screamed in an agony of terror. Before I could reach it, the Muishond released its grip on the side of the Hare's body and buried its sharp teeth in its victim's throat. Arriving on the scene of the tragedy, I shouted to attract the attention of the Muishond, thinking he would run off in alarm. The rascally little fellow, without even releasing his hold on the Hare, turned his back upon me, switched up his tail and sprayed my clothing with his enemy-repelling secretion. The smell was so nauseating that I became dazed and staggered backwards, and was obliged to cast my coat away before I could obtain even a measure of relief. Although angry with the little fellow, I admired him for his boldness and left him in peace, for the Hare was his legitimate prey, and he had hunted it down in a thorough sportsmanlike fashion.

The Cape Hare, like most others of its kind, is speckled black and yellowish-brown, giving it a greyish neutral sort of tint.

This hare is about 2 feet in length; the ears measure $4\frac{1}{2}$ inches, and the tail is white below with a broad black streak above, which narrows towards the tip of the tail. This black stripe is bordered with white.

It can be at once distinguished from a closely allied South African species of Hare (*Lepus saxitilis*) by the back of its neck being grey, or only very slightly rufous, and not strongly rufous, as in the other species, and on account of its smaller size.

There are several local races or sub-species of the Cape Hare.

THE SOUTH AFRICAN HARE OR KOL-HAAS

(*Lepus saxatilis*)

The South African Hare is known to colonists as the Kol-haas, because of the presence of a white spot on the forehead. This spot varies in distinctness. In some specimens it is very clear, and in others it is only noticeable on close examination.

Amongst the native races the Kol-haas is termed the Intenetsha and Nogwaja by the Swazi and Zulu tribes; Ikloli by the Basutos, and Umvundhla by the Amaxosa.

This species of Hare appears to be generally distributed from the Cape to the Zambesi. It is a more bush-loving species than the Cape Hare, for, instead of frequenting the open veld, it prefers bush-covered localities, and always prefers to make its "form" or lair in the midst of dense brushwood or undergrowth.

It lies very close, but when alarmed by dogs, or by casting stones into its retreat, it breaks cover with great bounds, usually accompanied with crackling and swishing of the herbage, so much so that the sportsman is often deceived into the belief that it is a buck which has bounded out.

These hares are very plentiful in the neighbourhood of Port Elizabeth and the surrounding districts; and during the game season great numbers are sent to market. They are always found in the bush-veld, and on the scrub-covered hills in these districts.

In the vicinity of Port Elizabeth they retire to the dense masses of undergrowth and patches of thorny scrub during the daytime, and issue forth into the open lands at night and play havoc in the vegetable gardens and farmer's fields. Like the Cape Hare they often frequent the roadways, and it is a common occurrence to come upon them suddenly when motoring or cycling at night.

The breeding habits of this Hare are similar to those of the Cape Hare. It also leads a solitary life, except at the breeding time. It has hitherto

been called the Rock Hare, which no doubt arose originally from confusing it with the real Rock or Red Hare (*Pronolagus*), of which there are two South African species and some local races.

The name of Rock Hare being erroneous and misleading, I have styled it the South African Hare.

It can be distinguished from the Cape Hare by its larger size; its long ears, which are 5 to 5½ inches in length; by the presence of a bright rufous patch on the back of the neck; and by a white spot on the centre of the forehead. In some specimens this spot is represented by only a few white hairs.

In all the specimens which I have examined, the upper part of the tail was black, bordered with a fringe of white. The black streak is broader in this species than in the Cape Hare.

There is a local race which differs slightly from the typical species.

THE RED HARE OR ROOI-HAAS

(*Pronolagus crassicaudatus*)

This Hare is better known to colonists as the Roode or Rooi-haas, Klip-haas and Rooi-staart. The Amaxosa call it the Intenetya.

It inhabits the stony hills from the Cape to North-Eastern Rhodesia. In the midlands of the Cape Province it is common amongst the rugged,

rock-strewn hills and slopes. When alarmed it usually lies close behind or amongst the boulders, and when discovered it darts off at an exceedingly rapid rate, dodging in and out amongst the rocks, and so actively that the sportsman must be rapid and expert in the handling of his gun to be successful in shooting it. The Red Hare deposits its excrement in the same place for years, and heaps 2 and 3 feet in height may often be seen.

This Hare does not form burrows. It conceals itself in crevices amongst the rocks, in the dense brushwood, and in the various cavities under boulders and overhanging rocks.

The Red Hare is a small rabbit-like species, with comparatively short hind-legs. It is 14 inches in length, not including the tail, which is bright rufous above and below. The head and back are speckled buff and black, as in the typical hares; a light rufous patch is present on the back of the neck; and the legs, feet and under parts are rufous.

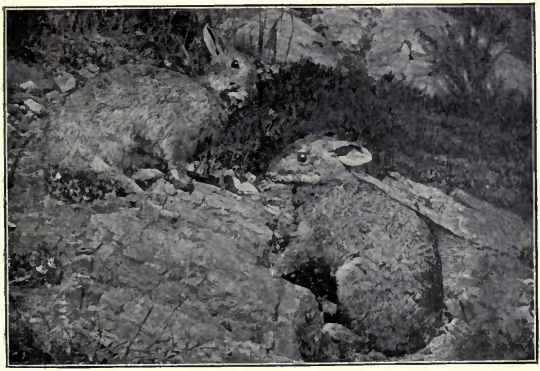
There are at least three local races of this small rabbit-like Hare.

THE ROCK HARE OR RHEBOK-HAAS

(*Pronolagus ruddi*)

The Rock Hare inhabits the tops of the mountain ranges and plateaus throughout South Africa. It

The Red Hare or Rooi-haas which inhabits the stony hills of South Africa.



The Rock Hare or Rhebok-haas whose home is on the tops of table-lands, krantzes, and stony mountain ranges.

is known to colonists as the Rhebok-haas because it is found in the haunts of the Vaal Rhebok.

In the uplands of Natal it is very common. I always found these hares on the flat tops of the plateaus, where they lived in colonies in retreats under overhanging rocks on the edges of the krantzes. In situations which did not afford a sufficiency of secure rock shelters of this nature, they formed burrows after the manner of the rabbit.

On the top of a large Table Mountain, near Pietermaritzburg in Natal, I discovered several deep burrows, usually at the bases of masses of boulders. Judging from the quantity of soil cast out at the entrance, these burrows must have been at least three yards deep. On several occasions I observed half-a-dozen and more hares enter one burrow.

The Rock Hare lies in its secret hiding-places by day and issues forth at dusk, and is active throughout the night. It never ventures far from its retreat, to which it instantly rushes on the appearance of a foe.

Its diet consists of the scanty herbage which grows on the tops of the plateaus.

In Natal we frequently hunted these hares by moonlight. Choosing a bright, clear night when the moon was full or nearly so, we walked as noiselessly as possible along the tops of the krantzes within about ten to twenty yards of the edge, between the herbage and the rocks. The hares, which had ventured some distance from their

retreats in search of food, made for their lairs at full speed, and in doing so were obliged to run across our front, or dodge past in our rear. Although they apparently afforded a good mark, yet it was by no means easy to shoot them, their forms being so shadowy, and the moonlight so deceptive.

On being disturbed while feeding, the bucks stamp loudly, and emit a peculiar grunting hiss, which is often continued while they are racing for shelter.

The degree of celerity with which these hares can race amongst the boulders and dart into their lairs on the edges of the cliffs, is little short of marvellous. It is, as a general rule, impossible to reach their lairs under the overhanging boulders and slabs of rock on the tops of the krantzes without the aid of a strong rope, and reliable men to hold it securely.

On one occasion we managed to catch a glimpse of a family of these hares huddled up in a rather large crevice under an overhanging rock at the edge of a krantz five hundred feet or more in height. This was accomplished by tying a rope around each ankle of a member of our party, and carefully letting him down over the edge of the cliff, head foremost.

The Rock Hare is large and robust, averaging 24 inches in length; the hairs of the head and back are yellowish-buff, tipped with black, giving the animal a grizzled appearance, which is

darkest along the centre of the back. The back of the neck is dull yellowish-brown; lips and throat white; the nose from the tip, for an inch up towards the forehead, is tinged with rufous-brown; tail rufous above and below; limbs rufous, deeper on the outer sides; under parts dull white with a reddish tinge.

The ears are remarkably short for so large a Hare, being barely $3\frac{1}{2}$ inches in length.

There are at least four other species of comparatively little-known hares inhabiting Zululand, Transvaal, Kalahari and Southern Rhodesia.

WHALES

THE shape which Nature has given the Whale is perfectly adapted for navigating the vast oceans. To render the body as inconspicuous as possible to enemies, the Whale's back is dark, and the lower parts are usually white. It has one drawback, however. The Whale, like all other warm-blooded mammals, obtains its life-giving oxygen direct from the air; it is therefore obliged to live upon the surface of the water most of its time. When it dives it has to come up again to breathe. The nostrils open separately, or more usually by a single opening on the top of the head. When the Whale comes to the surface, its first act is like that of a man who comes up after a long dive. It discharges the vitiated air from its lungs before filling them again with fresh air. The air is driven out of the Whale's lungs with such force that it ascends to a considerable height. This air is saturated with water at a high temperature, and on coming in contact with the colder outer air, the warm vapour in the expired air condenses and forms a column of steaming mist which is visible at a great distance. Often, however, a Whale begins to discharge the air from its lungs before the nostrils are actually

above the surface of the water. In these instances a quantity of water is driven up into the air with the expired breath. This, then, is what is popularly known as " blowing " or " spouting." It is simply the condensed water vapour from the Whale's lungs, similar to the air we sometimes forcibly discharge from our own lungs on a cold frosty morning.

The tail of a fish is vertical, whereas the tails of Whales, Porpoises and Dolphins are horizontal. This, no doubt, is for the purpose of giving greater power in propelling the body more rapidly to the surface of the water. If Whales were direct descendants of fishes, Nature would not have erred so gravely as to take away their gills and substitute lungs, which are of lesser service than gills would be to a Whale in its watery environment. The fact that whales still retain vestiges of hind limbs, and traces of a hairy covering, are sufficient evidence that their remote ancestors were terrestrial or semi-terrestrial animals. In the Whale we have one of the most specialised of all living mammals. The time it must have taken to evolve a huge animal with limbs into a creature with the present form of the Whale can be better imagined than described. It was at one time thought that whales were the descendants of a primitive type of ungulate or hoofed mammal. There is now some evidence to show that modern whales are closely related to a primitive and extinct carnivorous animal known as a Zeuglodont which existed during the Eocene division of the Tertiary

period. Therefore, if this is so, the ancestors of whales were carnivorous, and not herbivorous as was previously thought. Lydekker thinks that modern whales are the direct descendants of a small, primitive and at present unknown Zeuglodont.

Whales of one species or another are found in all the oceans of the world, including the Arctic and Antarctic Seas.

The Cetaceans, which include Whales, Dolphins and Porpoises are carnivorous, with the exception of a Dolphin, which frequents the rivers of the Cameroons on the West Coast of Africa, and which is stated to be herbivorous.

The Killer or Grampus Whale is a veritable tiger of the ocean. It attacks, kills and feeds on other species of whales and seals. This is the only Whale which preys on warm-blooded animals. The others feed on fishes, crustaceans, jelly-fish, squids, octopi, pteropods, etc., according to their kind.

In former times most species of whales associated in " schools " or herds, and numerous instances are on record of the solicitude of individual members of a school to one another.

When the young are about to be born, the whales usually seek the shelter of some inlet or bay. One calf is brought forth at a birth, but some Rorquals produce two. The mother suckles her young with milk from mammary glands after the manner of other mammals, and the calf remains with her until sufficiently large and strong to take care of itself.

WHALEBONE WHALES

It is popularly believed that all whales possess whalebone, technically known as "Baleen." This is by no means so.

The Whalebone Whale is destitute of teeth, but in place of these, its mouth is furnished with two rows of dark, horny plates of baleen or whalebone. These plates are attached to the palate, and hang downwards when the Whale opens its mouth. The Whalebone Whale or Right Whale, as it is usually known by, subsists on the various kinds of small ocean creatures which congregate in vast shoals. Swimming in the midst of a shoal of them it takes an immense mouthful of water, the water drains out between the frayed edges of the flat pieces of baleen, which partly overlap one another, and the living creatures which are retained lie on the great tongue of the Whale and are swallowed at leisure. The whalebone is simply a strainer which allows the water to drain away, and at the same time prevents the prey from escaping. The water is forced out by the act of raising the tongue. The food consists entirely of tiny shrimp-like molluscs and crustaceans which occur in vast shoals on the surface of the water. The number consumed daily to satisfy the appetite of this immense creature must be stupendous.

In the Port Elizabeth Museum there is on exhibition the entire skeleton of a Whalebone Whale

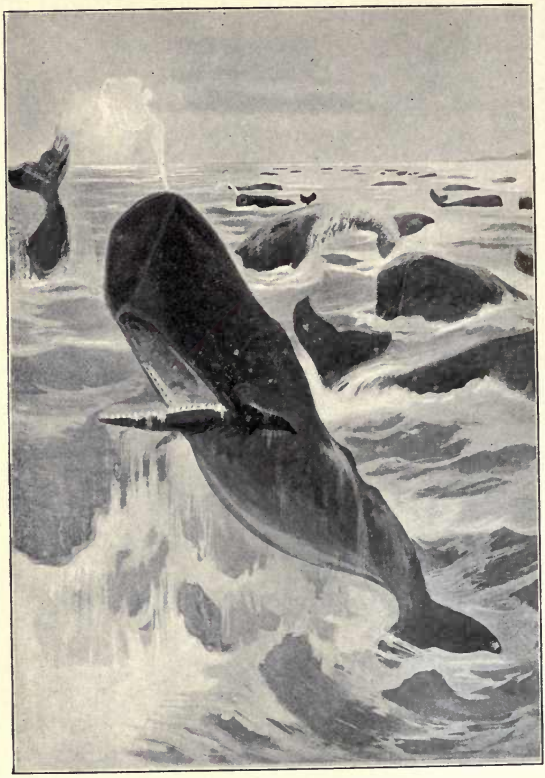
(*Balæna australis*). In former days these whales, at certain seasons, came into Algoa Bay to give birth to their young, and a whaling industry flourished there.

This skeleton is not only highly valuable as a specimen of probably one of the largest of its kind, but it is of considerable local interest and value, representing for all time to the citizens the former existence of a whaling industry connected with Port Elizabeth, and the fact that at one time the Bay was a favourite resort of monster whales nearly 70 feet in length The skeleton in the museum is exactly 61 feet long, and the Whale in the flesh must have been about 70 feet in length. The Whalebone Whale is hunted for its blubber and whalebone. The whalebone or baleen does not appear until after birth. The length and breadth of the plates differs in the various species. The baleen of the huge Right Whale for instance, is broad and long; while that of the Hump-backed Whales is comparatively small. In colour the baleen varies from black to creamy-white, or it may be striped. In the Whalebone Whales the female is usually much larger than the male.

THE SOUTHERN BLACK RIGHT WHALE

(*Balæna australis*)

This great Cetacean, which attains a length of about 70 feet, was formerly quite common in the



A school of Sperm Whales.

From a drawing by A. Twiddle. Reproduced by kind permission from the Children's Magazine.

ocean around the South African coast, and it was no unusual sight for the citizens of the coastal towns to see these and other species of whales disporting in the bays.

These great mammals of the ocean have been so mercilessly hunted for their blubber and baleen that they are now rare visitors to our coasts. They came into the bays usually in June and July in pairs, and if not killed or driven off, the female, soon after arrival, gave birth to her calf.

Even whales are tormented by parasites. A large barnacle (*Tubicella trachealis*) attaches itself to whales and deeply embeds itself in the skin, often setting up great irritation. To rid itself of these unpleasant and annoying parasites, the Whale often comes into comparatively shallow water in order to rub its irritated skin against the rocks. In the endeavour to scrape off these barnacles, the huge creature occasionally gets stranded, and perishes before the return of the tide. The weight of a Whale is so great that when stranded on the sand or rocks its chest is crushed in.

The Southern Right Whale is so similar to the Nordkaper (*Balæna glacialis*) which inhabits some of the oceans north of the Equator, that naturalists have questioned the wisdom of making a separate species of it, some maintaining that the differences only justify it being ranked as a local race or sub-species.

The fossil remains of several species of Right

Whales have been found in the Pliocene deposits on the east coast of England and in Belgium.

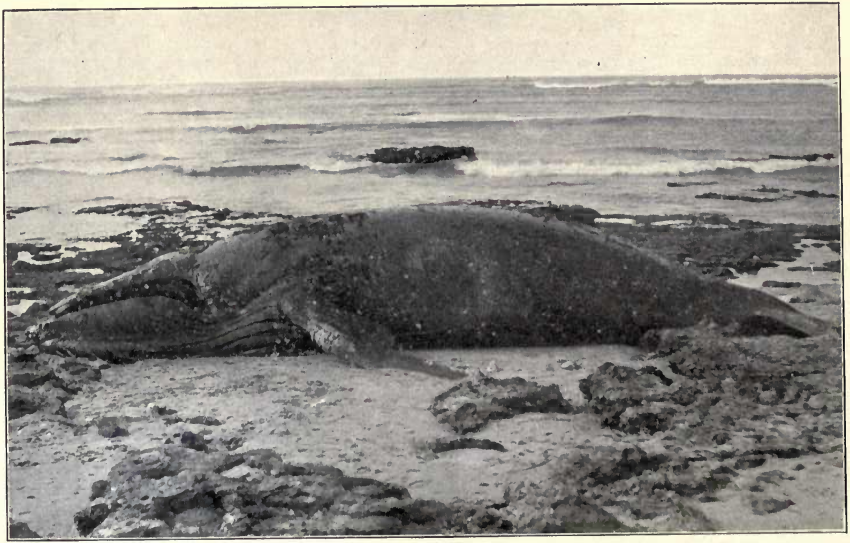
The Right Whale (*Balænidæ*) is distinguished from all other genera of whales by the absence of a dorsal fin, and by the skin of the throat being smooth. The dimensions of a Southern Right Whale caught in Algoa Bay are: 70 feet long; 15 feet in height at thickest part; head 16¾ feet long; width of tail from point to point 16¼ feet.

The name "Right" Whale was given by sailors because it was the right sort of whale, viz. the most valuable to them.

THE HUMP-BACKED WHALE

(*Megaptera longimana*)

The Hump-backed Whale is common around our coasts, and may often be seen in pairs. I have frequently watched them near the coast at Shoemakers Kop near Port Elizabeth, and on two occasions I witnessed a prolonged fight between two males. The tail and pectoral fins are used as weapons. The tough fin, which is 10 feet long, was raised high into the air; the Whale brought his body alongside his foe and rolled partly over to obtain greater striking power. Then, rolling back, he brought the fin down on his antagonist with a resounding whack. He then swerved outwards and delivered a terrific blow with his tail. To diminish



The Hump-back Whale (*Megaptera longimana*) which was cast up on the beach in Algoa Bay.

the force of these blows which the whales aimed at one another, they plunged, partly submerged, leapt from the water, or twisted and turned. The surrounding water was beaten into white foam. Eventually one gave up the fight and made off with a succession of dives, closely pursued by the other.

The dead bodies of these Hump-backed Whales are sometimes washed up in Algoa Bay and its neighbourhood. During the past eleven years I have recorded five.

On July 15, 1918, one of these whales got stranded on the rocks just outside Algoa Bay, midway between Humewood and Cape Receife lighthouse. The incoming tide brought it over the rocks on to the sandy beach. It measured 29 feet and was black above and white below, the pectoral fins being mottled black and white. The blubber on the back and sides was 6 inches in thickness. A considerable number of ship barnacles (*Conchoderma aurita*) and coronetted barnacles (*Coronella diadema*) were deeply embedded in its skin, mostly on the head, lips and sides. These must have caused their host a considerable amount of annoyance. Around the bases of the barnacles, and in the various folds and scratches on the skin, thousands of small crab-like crustaceans (*Cyamus*) clung.

The Malays assembled in hundreds to secure the blubber and flesh. The former was reduced to oil, and the lean meat was greedily eaten. It was bright red and looked like the best sirloin. The

Malays declared it to be tender, juicy and of good flavour. The skeleton and baleen were secured for the Port Elizabeth Museum.

In the past this species of Whale came into the various bays in mid-winter to produce their young, but man's merciless persecution has resulted in their seeking more hospitable shores for bringing forth their progeny.

The whalebone of the Hump-backed Whale is short and consequently not of much commercial value; and the blubber is not sufficient to make it worth while to hunt it too far afield.

The Hump-backed Whale is, however, rapidly disappearing from South African waters.

Hump-backs frequent nearly all the seas of the world, and they all seem to be of one species, although some naturalists claim the Hump-back of the Persian Gulf to be distinct from the common form.

The name Hump-back is derived from an elevation on the back which carries the dorsal fin. This prominence varies very much in different individuals. When "sounding," these whales can remain about twenty minutes under water. On rising to the surface they always "blow," and the column of vapour rises to a height of fifteen feet.

The amount of oil yielded by a Hump-back varies considerably. Females with large young ones are lean and often yield about ten barrels of oil, while others have yielded as much as seventy-five barrels.

These whales, when fully adult, average 40 to

Hump-back Whale (*Megaptera longimana*) cast up in Algoa Bay. Front view shewing the baleen or whalebone in the mouth.

50 feet in length, and the pectoral fins attain a length of 14 feet. The female is always much larger than the male.

THE RORQUALS OR FIN WHALE

The Rorquals or Fin Whale (*Balænoptera*) differs from the Hump-back by reason of its long and slender body, flatter and smaller head, and comparative shortness of the flippers which are pointed and narrow. The whalebone is also shorter and coarser than that of the Hump-back. The Rorquals is more widely distributed over the oceans of the world than any other species of whale. They inhabit the oceans off the coast of South Africa, but do not extend to the Antarctic seas. They were not molested by man in the past because of their comparatively small yield of blubber and inferior whalebone. Owing, however, to the increasing scarcity of whales, and the improved methods of killing whales, they are now being hunted and destroyed in large numbers. There are several species of Rorquals, and they range from 30 feet in length in *Balænoptera acuto-rostrata* to 85 feet in Sibald's Whale (*Balænoptera sibbaldi*).

The fossil remains of several species of Rorquals have been found in the Pliocene deposits of Belgium and the east coast of England.

THE SPERM WHALE OR CACHALOT

(*Physeter macrocephalus*)

The Sperm Whale can at once be distinguished from all other whales by its massive head, which is about a fourth of the length of the body, its great size, and the presence of twenty to twenty-five large conical teeth in either side of the lower jaw. The upper jaw is devoid of whalebone, but instead there is a set of teeth which are rudimentary and do not cut through the gum. The male Sperm Whale grows to a length of 60 feet; the female is not so massive in form, and is only about one-half the length of the male.

On the upper surface of the skull there is a large hollow space, behind which a vertical wall of bone rises. The cavity is filled with the oil known as spermaceti. It congeals on exposure to the air.

The Sperm Whale feeds upon the larger fishes, squids, octopi and cuttles. To obtain its food it sounds or dives, often to great depths. It inhabits all the oceans of the world with the exception of the Polar regions, and wanders vast distances. It is found in greatest abundance in the tropical and sub-tropical seas.

Sperm Whales have been found stranded on the

South African coasts. A male of maximum size was harpooned in Algoa Bay in 1897, and its skeleton is now on exhibition in the Port Elizabeth Museum. In cutting up this carcase an inexperienced man made a great hole through the soft blubber and flesh of the head, tapping the large cavity which held the valuable spermaceti oil, which gushed out and was lost in the sand.

Unlike the Whalebone Whales which seek quiet bays when about to bring forth their young, the Sperm Whale gives birth to its young out at sea. One calf, as a general rule, is produced at a time. At birth it is from 11 to 14 feet in length.

Sperm Whales in the past assembled in great "schools" of twenty to several hundred individuals, composed of cows and one to a dozen bulls, according to the size of the herd. These formed one division or troop, and the young bulls gathered together and formed a second division. Owing to incessant persecution by man, Sperm Whales are now only met with in pairs or in small schools of a few individuals. They are able to descend to great depths, and remain down for an hour at a stretch. The Sperm Whale is covered with a thick layer of blubber, which yields the sperm oil of commerce. Spermaceti, which is in a fluid condition until exposed to the air, is confined to the cavity in the head. The spermaceti is ladled out in buckets when the carcase is being cut up. The use of this great quantity of oil in the skull is not

known. Being lighter than water it would enable the Whale to come to the surface more rapidly head foremost. Ambergris is a product of this Whale. It is a concretion formed in the intestines, and always contains a number of the hard beaks of the cuttles and squids on which the Sperm Whale feeds. Ambergris is occasionally taken from the intestine of the animal, and is sometimes found floating on the surface of the ocean. It was formerly used as medicine, but is now employed exclusively in perfumery, and commands a very high price.

Adult bull Sperm Whales yield eighty to a hundred barrels of sperm oil.

This Whale is steadily decreasing in numbers, and before long it will become extinct unless its ruthless destruction by man for material gain is checked. The extinction of Sperm and other Whales will undoubtedly lead to a serious upsetting of the balance of nature in the ocean, and in all probability will adversely affect the human food-supply from this source.

Fossil remains of Sperm Whales have been found in the Miocene and Pliocene portion of the Tertiary geological period.

LESSER SPERM WHALE

(*Kogia breviceps*)

The Lesser Sperm Whale only attains a length of 10 feet, and the teeth in the lower jaw are nine to

fifteen on each side. These teeth are slender and long, with curved points, and differ from those of the Sperm Whale in having a coating of enamel.

Although widespread in its distribution, the Lesser Sperm Whale is comparatively rare everywhere.

Specimens have occasionally been stranded on the South African coast. The Port Elizabeth Museum has records of several which have been washed ashore in Algoa Bay and its vicinity, but in no instance has a complete undamaged skeleton been secured. When the carcases drift ashore, they are usually incomplete owing to the ravages of sharks.

BEAKED WHALES

THE Beaked Whales are so called because of the great development of the beak of the skull, which is composed of durable and solid bone, as dense as ivory. These Whales possess a single pair of teeth usually about midway between the anterior and posterior parts of the lower jaw. There are several species of Beaked Whales recorded from the Northern and Southern Hemispheres.

CURVIER'S WHALE

(*Ziphius cavirostris*)

CURVIER'S Whale is porpoise-like in shape. Specimens have been recorded 30 feet in length. Although of almost world-wide distribution, it is rare everywhere. Having been recorded from the seas off our coast, it is included in the list of South African animals.

Curvier's Whale has a pair of average-sized conical teeth in the lower jaw near the front. These point upwards and forwards.

LAYARD'S BEAKED WHALE

(*Mesoplodon layardi*)

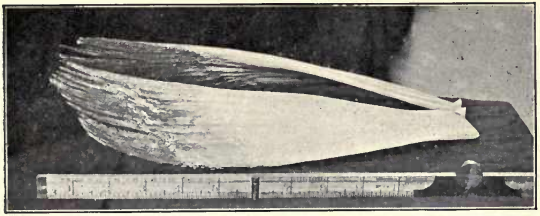
LAYARD'S Beaked Whale is the most striking and interesting of the Beaked Whales by reason of its enormous strap-like teeth which grow out of the lower jaw and, curving over the upper jaw, almost meet above. This Whale is an inhabitant of the Southern Ocean, and is comparatively rare. It has been recorded at intervals in the seas around the South African coast. A specimen in the flesh was washed ashore at the mouth of Zwartkops tidal river in Algoa Bay on February 18, 1907. It was a male, 19 feet 2 inches long; tail 4 feet 6 inches from tip to tip; root of tail 9 inches in diameter; flippers 22 inches in length; dorsal fin 13 inches wide, 11 inches high, and situated 34 inches from the tail. From point of beak to the eye 38 inches; externally 4 feet from tip of beak to its base; penis 16 inches.

The strap-like curved teeth were of ivory, surmounted by a small conical elevation of enamel, in appearance like a little canine tooth growing on top of the tusk. These great, curved, flat-sided teeth were eleven inches long from the surface of the gum to the tip.

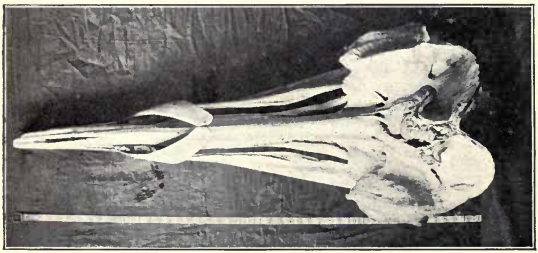
The colour of the back was dark brown, almost black on the back; gradually growing lighter on the sides and tail, and gradually merging into dirty

whitish on the belly. Other specimens have been described as black on the back and white beneath, with a distinct line of demarcation between the two colours. It is hardly likely, however, that the colouring should be so different in individuals of the same species. The colour of the Port Elizabeth specimen was very carefully noted when we were cutting up the carcase.

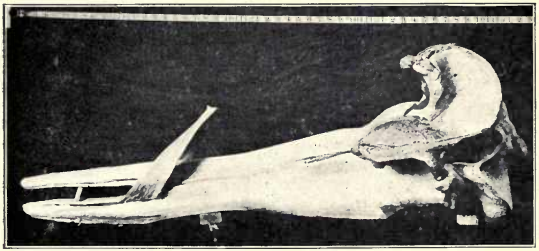
The curve of the two big teeth only made it possible for our specimen to open its mouth from 4½ to 5 inches at the tip. The skin of the beak on the upper part immediately under the tips of the strap-like teeth did not show the slightest sign of abrasion or thickening, indicating clearly that the Whale, in life, only opened its mouth as far as the teeth permitted. If the animal had previously been in the habit of opening the mouth wider, and the teeth had subsequently curved over the upper mandible and restricted the extent of the gape, the constant tendency would have been for the soft skin under the teeth to have come daily in more or less violent contact with the under part of the arch formed by the teeth, and an abrasion, a callosity or dent would have resulted. The width of the gullet was 1¾ to 2 inches in diameter, indicating the food consisted of small-bodied creatures, or those with soft bodies which could be torn in small morsels before being swallowed. The small, conical, enamel elevations which are present on the tips of the curved



The tusks of Layard's Beaked Whale. They are 12 inches in length.



Skull of Layard's Beaked Whale viewed from above. It is 2 feet in length.



Side view of the same shewing the strap-like tusks *in situ*.

tusks were used, probably, as an aid in tearing aside the seaweed when in search of prey, and in breaking up the substance of soft-bodied animals such as jelly-fish, cuttles, etc., preparatory to feeding on them. Why Nature should evolve such teeth is a mystery, unless they are curved over the upper mandible for the purpose of preventing the possessor of them from taking too big a morsel into its mouth and choking itself.

BLAINVILLE'S BEAKED WHALE

(*Mesoplodon densirostris*)

This Whale is also known as the Seychelle Zephius (*Dioplodon sechellensis*). It has been recorded from Seychelles and the South African seas. The species is apparently exceedingly rare. It differs from other Beaked Whales in the size and length of its teeth. There is a single pair set in the lower jaw, 6 inches in length, $3\frac{3}{8}$ inches in width, and $1\frac{3}{4}$ inches in thickness.

Extinct species of Beaked Whales have been found in the Miocene Teritary deposits of North America and Europe.

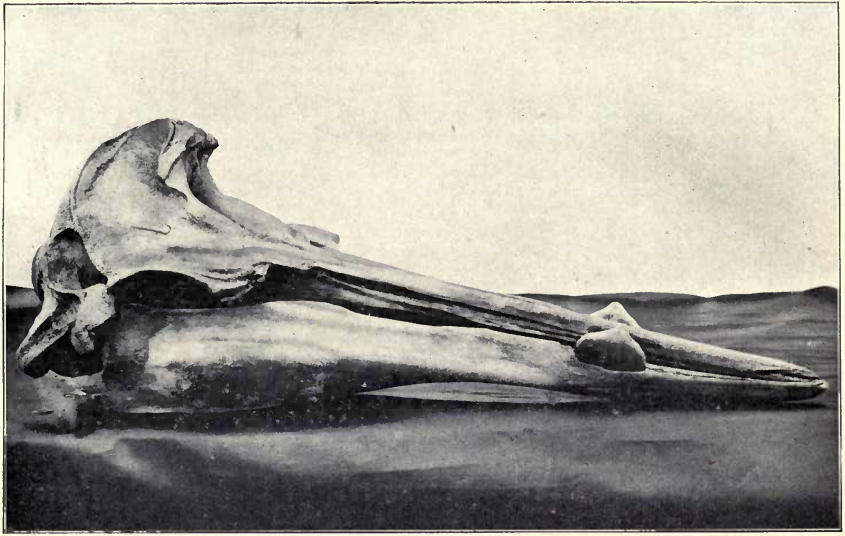
SOWERBY'S BEAKED WHALE

(*Mesoplodon bidens*)

Sowerby's Beaked Whale has been recorded from the north Atlantic and off the coasts of Europe,

but none have been known to occur in the Cape Seas until a specimen was washed up in the flesh S.E. of Cape Receife outside of Algoa Bay, at a spot known as Shell Bay, in April 1910. This is the first recorded specimen from the Southern Seas, and the only one up to the present from the seas off our coasts. It was carefully measured and photographed before being carved up. The complete skeleton is on exhibition in the Port Elizabeth Museum. The specimen when in the flesh was black all over, and the skin was as thin as paper. The body was covered with blubber, which was 2 inches deep on the back, and $1\frac{1}{2}$ inches on the sides and abdomen. It was an adult, and measured 15 feet 6 inches total length.

The other measurements are as follows: tail from tip to tip 52 inches; flipper 20 inches; from tip of beak to eye 27 inches; gape 16 inches. Lower jaw protrudes 1 inch beyond upper jaw. Circumference at middle of body 8 feet. From anterior of fin on the back to centre of tail 6 feet 7 inches. Height of back fin 8 inches. A single pair of teeth in the lower jaw. These are set deep in the bone, and the exposed portion is enamelled. The two teeth are of the same size and shape. They are $2\frac{7}{8}$ inches wide, $2\frac{3}{4}$ inches long, $\frac{7}{16}$ inch thick. The conical points are vertical.



Skull of Sowerby's Beaked Whale shewing the curious tusks in the lower manible. This whale was cast up on the beach near Port Elizabeth.

THE PORPOISE AND DOLPHIN

The remaining members of the Cetacea are all included in one family, viz. *Delphinidæ*, which includes a large number of species.

With the exception of the Narwhal and Risso's Dolphin, all the members of this family are of small or medium size, and possess a large number of teeth in the upper and lower jaws. There are other anatomical differences.

A fairly large number of members of this family have been recorded from the seas off the South African coasts. For instance:

THE KILLER OR GRAMPUS

(*Orca gladiator*)

The Killer is aptly named, for it is the most voracious of all the Whale, Porpoise and Dolphin order of animals. The Killer attains an average length of 20 feet, and the world is its hunting grounds. Associating in small parties they attack and devour all other members of the Whale Order as well as seals and fishes. Its appetite is enormous and almost unbelievable. A Killer of 21 feet in length

was taken, and its stomach contained thirteen Porpoises and fourteen Seals.

Like a pack of wolves they attack the great Greenland Sperm Whales and, clustering round their heads, they tear great pieces out of their helpless prey.

The back fin of the Killer, especially in the male, is of great height, being often almost 4 feet. It rises high out of the water when the animal is skimming along just below the surface.

The other members of the family which have been found in the Cape Seas, according to Mr. W. L. Sclater, are:

THE CAPE BLACK FISH OR CA'ING WHALE

(*Globicephalus macrorhynchus*)

Rare in Cape Seas.

RISSO'S PORPOISE

(*Grampus griseus*)

Rare in Cape Seas.

THE LITTLE INDIAN PORPOISE

(*Neophocæna phocænoides*)

Rare in Cape Seas.

Sowerby's Beaked Whale (*Mesoplodon bidens*). Photo of a specimen cast up on the beach on the West of Cape Recipe, near Port Elizabeth.

GRAY'S PORPOISE

(*Lagenorhynchus obscurus*)

Occasionally captured in the Cape Seas.

THE TONINE

(*Cephalorhynchus heavisidii*)

Rare in Cape Seas.

NARROW-SNOUTED DOLPHIN

(*Prodelphinus attenuatus*)

Rare in the Cape Seas.

THE EUPHROSYNE DOLPHIN

(*Prodelphinus euphrosyne*)

Rare in the Cape Seas.

A mounted specimen is on exhibition in the Port Elizabeth Museum.

LONG-BEAKED DOLPHIN

(*Prodelphinus longirostris*)

Rare in the Cape Seas.

THE COMMON PORPOISE

(*Delphinus delphis*)

This Porpoise or Dolphin inhabits all the warmer seas; they associate in shoals, and they feed on fishes. They grow to a length of 12 feet. This is the species of Dolphin which is commonly seen gambolling round ships as they plough their way through the ocean. These "Porpoises," as they are popularly termed, may often be seen in numbers of from six to about twenty in our bays.

One offspring is produced at a birth, and the mother guards it with jealous care.

BOTTLE-NOSED DOLPHIN

(*Tursiops tursio*)

Rare in Cape Seas.

ROUGH-TOOTHED DOLPHIN

(*Steno rostratus*)

The Rough-toothed Dolphin inhabits the Southern Atlantic and Indian Oceans. It occurs in the seas around the South African coast.

A bull Elephant Seal shewing the elongated proboscis. A cow is seen in the background. The cows are much smaller than the bulls. They lack the large snout of the male.

From American Museum Journal.

THE SOUTHERN ELEPHANT SEAL

(*Macrorhinus coninus*)

During the first week in January 1919, a bull Elephant Seal came ashore in Algoa Bay midway between Port Elizabeth and the Zwartkops River. After remaining on the beach for some hours it sheered off and subsequently went ashore on the sand at the north side of the Zwartkops tidal river where it was shot. The total length of the animal in the flesh was 16 feet 11 inches. The skin was mounted and it, along with the skull, is on exhibition at the Port Elizabeth Museum. It is probable that when out fishing, this huge bull seal lost his way, or was driven by a violent ocean storm towards the South African coast from the Antarctic Sea.

Elephant Seals formerly inhabited a large number of the islands in the South Atlantic, Pacific and Indian Oceans. They are now rare, except on some of the islands in the Antarctic Sea.

There are two species and several local races of these seals. The Southern Elephant Seal (*Macrorhinus coninus*) is not found north of 35 degrees south latitude; and the Northern Elephant Seal (*M. angustirostris*) does not occur south of 24

degrees north latitude. The southern species is larger than its cousin of the north, and it also differs in skull structure.

The Elephant Seal has a deep layer of blubber, often six or seven inches thick under its skin, and the oil is superior to whale oil. The greed of man has nearly led to the extermination of this unique mammal of the sea, and unless active measures are taken to protect it against oil hunters, it will soon be extinct.

Sea Elephants attain a length of 20 to 22 feet, and the girth of a large bull is as much as 16 feet. Such an animal would yield 210 gallons of oil. The females are much smaller than the males; they do not exceed 10 feet in total length. The hair is very short and close. It is not noticeable until the animal is closely scrutinised. The colour of the hair is a dirty yellowish-grey, darker on the upper parts. The proboscis of the male takes the form of a short trunk which can be expanded or contracted at the will of the animal. The nostrils are at the end of the trunk. The eye is large and dark brown, with a narrow ring of reddish white encircling the iris.

When on shore the Elephant Seal is a great hulking-looking animal, and does not show much disposition to move even when prodded with a stick. They crawl over the sand very slowly and awkwardly, using only the fore flippers to help them along. When moving, they wriggle with a

snake-like motion. They usually excavate deep trenches in the sand and lie in them.

Elephant Seals gather to breed on the islands of the Antarctic in August, and depart in February or March. Specimens have recently been obtained from Kerguelen Island.

The Elephant Seal in the Port Elizabeth Museum is the only authenticated instance of one of these great carnivorous mammals of the ocean landing on the South African coast.

NOTE.—This article on the Elephant Seal is out of its proper place in this volume. It was too late for insertion in Vol. I.

THE SCALY ANT-EATER OR PANGOLIN

(*Manis temmincki*)

Kwara of Basutos; Khaaka of Bechuanas.

The nearest relative of the Aard Vark in South Africa is a curious prehistoric-looking animal known as the Scaly Ant-Eater or Pangolin (*Manis temmincki*). It is altogether unlike its cousin for, instead of a tough, hairy skin, this curious creature is covered with broad, overlapping, horny scales of a dark brown colour, which are paler at the edges and tips. It is quite toothless, as are all the other species of Pangolins in South America and Asia.

This remarkable looking mammal, which is curiously like a reptile in appearance, is found in termite and ant-infested districts, from the Orange River northwards through the Free State, Transvaal, Bechuanaland, Kalahari, South-West Africa and Rhodesia. Beyond the Zoological boundaries of South Africa it extends to South Angola, Nyassaland, and East Africa to Somaliland.

The Scaly Ant-Eater subsists chiefly on ants and termites. It breaks into the hills of the latter with its strongly armed fore-feet and collects the termites on its long, sticky tongue. This diet

is supplemented by insects which are troublesome to man.

It burrows into the ground, but not so deeply as does the Ant Bear. It also takes shelter under ledges of rock and in rock cavities, and may often be seen climbing amongst rocks. It is encountered at times in mimosa-covered, sandy localities. When desiring to view its surroundings I have seen it scale almost vertical krantzes, where the rocks are broken and rough and afford a foothold. The Pangolin stands at full stretch upright, supported by the tail and hind-feet. When suddenly surprised it rolls its body into a ball, and so tightly does it close up, and so closely do the armour plates cover the unprotected under parts, that carnivorous animals are powerless to harm it. When captured the Pangolin makes no attempt to retaliate, and is a perfectly inoffensive creature. Yet in spite of their usefulness in keeping in check the destructive termites and hosts of noxious insects including the dreaded locust, they are hunted down and destroyed, for what some men misname sport, but which in reality is cowardly persecution of eminently useful and innocent creatures. The chief offenders are the natives of the country who kill and devour great numbers of species of useful animals and their young.

A single young one is produced at a birth, and when born the scales are soft and do not harden for a day or two.

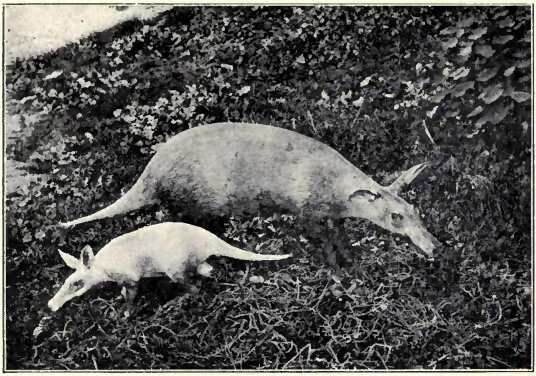
The Bechuanas in the past were in the habit of burning the Pangolin alive in their cattle kraals, under the belief that in so doing they increased the fertility of their cattle. This custom is still occasionally practised.

Peters mentions that rings are made from the scales and worn on the forefinger by natives, under the supposition that they protect the wearer from witchcraft.

The Pangolin in West Africa climbs trees and rests on the trunk by gripping the bark with the claws of the hind-feet, and supporting the body at right angles by means of the tail which acts as a prop. The Pangolin in South Africa is also stated to climb trees occasionally, but I have not been able to personally verify this.

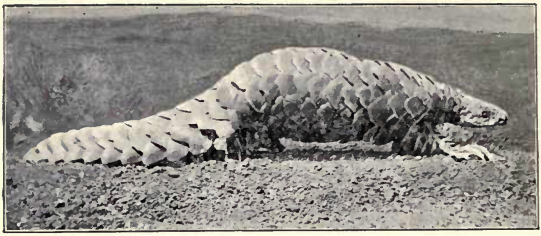
The Aard Vark and South African Pangolin belong to the order termed *Edentata*, which includes the Sloths, Ant-Eaters, and Armadillos of South America. These are divided into a large number of species or kinds. There are six species of Pangolins besides the South African one. All of these are confined to Africa and South-Eastern Asia, viz. four in Africa and three in Asia.

The Pangolin is esteemed by the natives and colonists as food, and owing to the slowness of its movements it falls an easy prey. Consequently before long it will, doubtless, be numbered with the extinct fauna of South Africa.

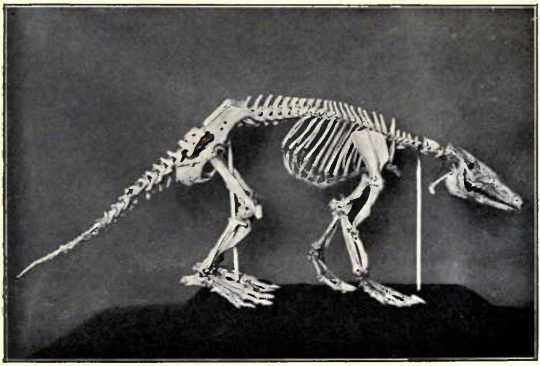


The Aard Vark or Ant-eater.

The skull of an Aard Vark shewing the teeth which are devoid of enamel.



The Scaly Ant-eater or Pangolin.



Skeleton of the Aard Vark.

From a specimen in the Port Elizabeth Museum.

THE AARD VARK OR EARTH HOG

Also called the Ant Bear and Ant-Eater

(*Orycteropus afer*)

Isambane of Zulus and Swazis; Ibenxa of Amaxosa; Takadu of Basutos; Takkaru of Bechuanas; Goup of Namaquas.

THE Aard Varkor Earth Hog, so called because of its burrowing habit and pig-like shape, is found in all parts of South Africa, and ranges as far north as Somaliland and Egypt. Although there is but a single species or kind now recognised, the Aard Vark, like most other species of animals, differs slightly in form and colour in the various districts, forming what are known as local races.

These slight differences in the form of the skull, teeth and colour are, however, not sufficiently pronounced to justify us in separating the Aard Vark into two or more species, although, it is true, some naturalists have made a new species of this animal north of the Zambesi, and have named it *Orycteropus æthiopicus*. This variety differs from the typical South African Ant Bear in having a longer inner toe on the fore-foot, a more scanty hair covering, and a shorter snout and tail.

The Aard Vark grows to about the size and

general bulk of an adult domestic pig, although it is in no way related to swine.

It is solitary in its habits, and is only seen in company during the breeding season, for the perpetuation of the race. The sexes then go their own way, and usually do not meet again until the following breeding season. The female gives birth to a single offspring during the winter months, usually in May, June and July, according to the part of the country the Ant Bear is inhabiting.

Although found in nearly all parts of the country, these animals are nowhere common. The Aard Vark is seldom seen, for the reason that it lies hidden in the depths of its burrow during the day, and only issues forth at night, and during the early hours of the morning.

The principal enemies of the Ant Bear, in the past, were the Leopard, Chita, Lion, Cape Hunting Dog and Python. The latter was a formidable foe to the younger animal, for it followed the creature down to its innermost lair and, constricting it, swallowed its body entire, afterwards coiling up in its victim's nest, and sleeping peacefully for a couple of weeks until its meal had digested.

The pygmy Bushmen of the past hunted down the Ant Bear relentlessly, and in many parts of the country succeeded in almost exterminating it. At the present day it is largely destroyed by the natives, as well as by colonists.

The Ant Bear excavates its burrow with its powerful front claws. The loose earth is thrown out behind by a scooping movement of the hind-feet. The bones of the legs are immensely stout, and their muscle and sinew attachments denote tremendous strength and endurance, as is in reality the case, for an adult Ant Bear will dig a hole on the hard veld and disappear from sight in a phenomenally short time.

So great is their endurance, and so rapidly do they burrow, that a gang of men working with pick and shovel consider themselves fortunate if they succeed in overtaking and digging out an Ant Bear. The usual plan is to estimate as nearly as possible the direction in which the animal is burrowing, and then sink one or two perpendicular shafts some distance in front. Even this does not always succeed, for the Ant Bear has very acute hearing and, divining the intention of its enemies, makes a detour.

It usually tunnels in zig-zag fashion about a yard below the surface, thus hoping to elude its pursuers. When hard pressed it sometimes digs down vertically.

The presence of flies around the entrance of a hole usually indicates an Aard Vark is within.

The large muscular tail is used as a shovel to cast the soil back, after the hind-legs have worked it from under the body of the animal.

When an Ant-Eater has succeeded in getting

partly within its burrow, it requires an enormous amount of force to drag it out. A reim is usually attached to the creature's hind-leg, and several strong men are required to exert their full strength to pull it out. The animal braces itself against the sides of the hole, distends its body, and grips firmly with its fore-paws, which are spread out, and grimly and silently resists.

The belief that a team of oxen sometimes fails to dislodge an Ant Bear is nonsense.

An Aard Vark, cut off from its burrow when out in search of food, is easily captured, for the reason that it is a poor runner. It requires several men with reims or ropes to take one alive. It can strike a powerful blow with its shoulder by making a rapid and sudden turning movement. I have seen a man's leg broken by such a blow.

Occasionally when riding over the lonely veld by moonlight, a hulking, ghostly-looking form may be seen ambling off. It is an Ant-Eater retiring, in alarm, to its burrow.

This animal is a most inoffensive creature. Its food consists entirely of termites, locusts and various odd insects.

Some species of termites which inhabit South Africa are a fearful scourge. Although not ants in a scientific sense, they are commonly known as "White Ants." These termites subsist upon vegetable matter, and do extensive damage by devouring the woodwork of houses, stacks of hay, lucerne,

forage, fencing posts, etc. If a farmer is foolish enough to leave a wooden implement in contact with the ground in a district inhabited by these pests, he will probably find that in a single night it has been demolished or damaged beyond repair.

The writer in Natal suffered thousands of pounds damage by the depredations of these White Ants. They demolished the woodwork of many houses, ruined furniture, and devoured the roots of hundreds of fruit and other trees, causing them to die or blow over with the wind. The cash value of damage done by termites in South Africa probably amounts to over a million sterling per annum.

The destructive species of White Ants do not usually build hills of any size. Often there is little or no external evidence of their existence, and it is only when digging or ploughing that the nest is noticed.

The Aard Vark's sense of smell is acute, and it, in consequence, has no difficulty in locating these underground termites' nests and, laying them bare, devours most of the occupants, including the queen, which is a dainty morsel of fat, the size of a human thumb.

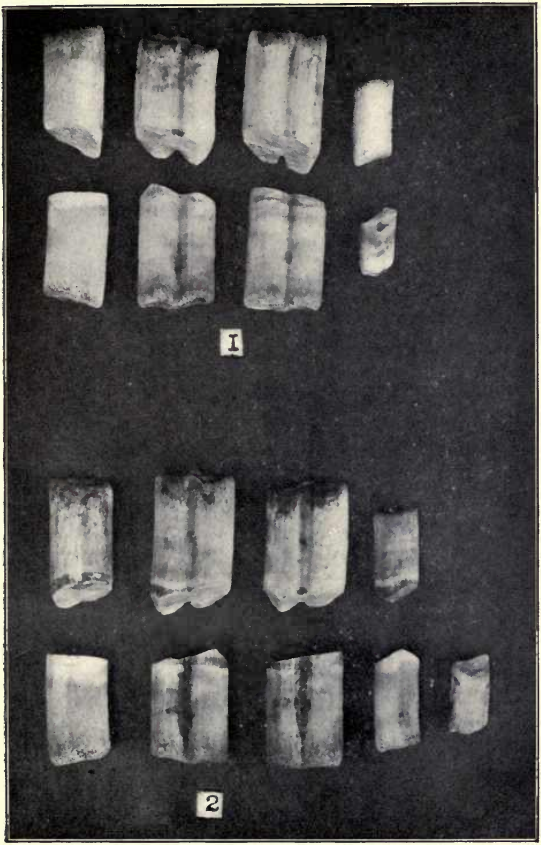
There are other species of termites which build roundish hills or mounds, and which are commonly known as Ant Hills or Ant Heaps. These are scattered in countless numbers over the hill-sides and veld of South Africa. Although these hill-building species of termites are not a serious pest to man,

they are, at least, of little or no economic value to him, except for the fact that the material of their mounds is sometimes used in the making of tennis-courts and the floors of outhouses. These termite hills are so numerous in many parts of the country that they cause serious obstructions to carts, wagons and horsemen traversing the veld, besides reducing the value of the land as pasturage for stock.

The diet of the Aard Vark consists of termites and it, in consequence, is of considerable economic value to man, and, unlike many other animals which are in the main very useful, but at times do considerable damage, the Ant Bear has few vices, from a human point of view. On occasion a rider gets a bad fall through his horse stepping into an Ant Bear burrow, or a young stock animal falls into one and perishes unless discovered in time. Sometimes the Ant Bear digs holes under Jackal-proof fences. The Jackals avail themselves of these holes, and, entering the enclosures, they destroy small stock such as sheep and goats.

The entrances of Ant Bear burrows are usually concealed beneath shrubs or in long grass. Out on the grass-veld the holes can invariably be located, as the grass and other herbage around the entrance grows more luxuriantly than elsewhere, owing to the rich subsoil thrown out by the occupant of the burrow.

The skin of an Ant Bear is thick, tough and fibrous, and the blade of a penknife will usually snap if an



Complete set of teeth of the Aard Vark. 1. Upper. 2. Lower.
The crowns of the teeth face each other.

attempt be made to drive it through the hide. An Ant-Eater will often make good its escape, even after several rifle bullets have penetrated its body. In these cases the animal dies a lingering and painful death in its burrow, as do countless other innocent animals which are wantonly wounded by men and youths with guns.

This was brought home to me with a shock one bright moonlight night when I was riding over the veld with some friends, and accompanied by several dogs. When passing over the brow of a low elevation, the dogs gave tongue and raced off after some large creature. In a minute or two they gathered round it, and riding up we whipped them off, and turned our attention to the creature, which proved to be an adult Aard Vark. We at once saw that it was in a crippled and appallingly emaciated condition. One of the party struck it a severe blow over the skull and put it out of its misery. We then examined it more closely, and discovered that the back leg had been shattered to pieces and the foot was dangling. The wound had been so horrible that it had failed to heal, and flies had laid eggs in the suppurating flesh, and in consequence most of the thigh was a putrid mass, seething with maggots. All this we clearly saw by the light of a bull's-eye lantern. The creature had, no doubt, been suffering the most horrible of torments for weeks, as it was evident from the appearance of the wound that it had not been recently inflicted.

Then again, it was apparent the animal had been painfully dragging itself about, trying to obtain food, but in its terribly crippled condition it was evident that it had not succeeded very well. This story has a sequel, for the following morning we put up at the farm of an acquaintance, and in course of conversation we told him about this Aard Vark. He seemed unusually interested, and presently startled us by suddenly jerking his pipe from his mouth and casting it violently upon the ground, exclaiming in a voice thrilling with anguish: "God in Heaven, it was I who shot that Aard Vark!" When he grew more composed he related to us that one night, returning in a bad temper after an unsuccessful stalk of some Springboks, he startled an Aard Vark, which ambled away to its burrow in alarm. He took aim and fired. He knew he had hit it for he saw it fall, but before he could ride up it had succeeded in gaining its burrow, down which it disappeared. He gave it no further thought, but simply rode on. He was a humane man, and this new aspect of the matter which our story opened up to his mental vision, had not occurred to him before, and consequently he was now much upset over the terrible torture he had thoughtlessly inflicted upon an innocent creature of flesh, blood and sensitive nerves like himself.

This brings to mind an occasion when I was present when an Aard Vark was being dug out of its burrow. After three hours' heavy toil, the natives, after

sinking two shafts in the direction the creature was burrowing, came upon it. However, it made a desperate bid for liberty for, with a rush, it came out of the hole and endeavoured to escape. However, one of the Kafirs made a grab and succeeded in laying hold of its tail with both hands. Away ambled the Aard Vark, with the man bumping along the veld behind it. He held on grimly, and after a run of about a hundred yards the other natives came alongside and cast a rope net around the creature and secured it. Shouting out a song of triumph, they shouldered it, and to-day it is enjoying a happy existence in a Zoological Garden with not a thought for the morrow, knowing full well the kindly keeper will, at certain times, bring it a dish of mincemeat and milk.

One day we surprised a large Python among some rocks which were partly covered by thick, scrubby bush, so common in South Africa. In the centre of this, among some dead leaves, the Python lay until my terrier-dogs disturbed its slumbers.

After much trouble I dislodged the reptile, for my object was to capture it alive, as I have always had a weakness for keeping live snakes. However, I noticed the snake was rather bulky in the part of him where we knew his stomach was located. Then he began a series of heaving movements, and presently disgorged the half-digested remains of a half-grown Aard Vark. Then, feeling lighter, he made off towards some adjacent rocks, but I soon

circumvented him, and, anon, had him safely lodged in a large linen bag which I always carried hanging from my saddle when on these expeditions.

On another occasion we observed a Python basking in the sun, but observing us it instantly vanished. On approaching we noticed that it had gone down an Aard Vark's hole. Piling up a quantity of stones at the entrance, we made the reptile a prisoner, and wended our way to the farmstead adjacent. Returning with a number of native labourers we eventually succeeded in digging the snake out. We came across it in a chamber at the end of the burrow, and on seeing that it was cornered it made a fierce lunge, and succeeded in gripping the bare arm of one of the natives. We tried hard to disengage its strong, recurved teeth, which were embedded deep in the man's flesh, but failed, so I reluctantly consented to allow the snake's head to be cut off. The jaws then relaxed. These snakes, however, are not venomous. Inside the body was a young Aard Vark, and in the hole we found forty-four eggs which the Python had laid. It had evidently gone into the hole to lay its eggs, and finding it already occupied, forthwith swallowed its inmate. Doubtless the mother returning home, and finding a sixteen-foot Python in possession, fled in wild alarm.

It is stated in Harmsworth's *Natural History* that the skull of a South American Ant-Eater may be battered with a heavy stone without producing

any other effect than temporarily stunning the creature. This, however, is not by any means so with the South African Ant-Eater. We have found that it will succumb to a comparatively light blow with a stick or stone on the skull, for the reason that the bones of the skull are exceptionally thin and easily broken.

The Hottentots frequently hunt the Aard Vark, armed with sticks and stones. The hunter creeps up as near to the animal as he can, and then, suddenly jumping up, aims a stone at its head. Should the aim be true, the animal invariably drops dead or stunned. If he misses his mark he tries to overtake the animal and, when within striking distance, delivers a blow over its skull with a stick or kerrie.

One moonlight night near Port Elizabeth, a gentleman was walking across the veld, accompanied by his Hottentot servant, when a large Ant-Eater shuffled away towards some bushes. The Hottentot picked up a pebble and cast it at the creature, which instantly fell. On examination it was found to be quite dead, the skull being shattered, although the stone was not a large one.

On dissection of its body my assistant found a fœtus nearly fully developed. This was on July 20, 1912, which is about midwinter in that locality. Judging by its development, the young one would have been born within a couple of weeks.

The mouth of an Ant-Eater is small, and situated under the snout, which protrudes over it. The

tongue is conical and long, and can be thrust as much as ten inches out of the mouth.

The Ant-Eater, after excavating a cavity in the side of a termite's nest or hill, thrusts out this long tongue, which is covered with a sticky mucus. The alarmed termites swarm out into the breach and stick in thousands to the tongue, which is withdrawn into the animal's mouth, and the termites, after being chewed a few times, are swallowed. The tongue darts rapidly out and in, until the nest is exhausted of its inhabitants, or the creature's appetite is appeased. The number of termites required to satisfy so bulky an animal as an Aard Vark must be prodigious. The ease and celerity with which it is able to pick up individual termites, ants, beetles, grasshoppers, locusts and other insects is astonishing.

The entrances of an Ant-Eater's nostrils are covered thickly with hairs, arranged in such a way as to present an effectual barrier to the entrance of ants and termites into the nasal cavities. When captured, the chief difficulty is to induce the Ant Bear to eat. Once it can be induced to take food, there is no further difficulty, for it soon becomes quite tame, and continues to keep in good condition and thrive unless confined in too small a cage, as is so commonly the case in Zoological Gardens. We have succeeded in keeping Ant Bears for long periods in health and strength on mincemeat mixed with cow's milk. Captive Ant Bears, during the daytime, lie coiled up asleep in the darkest corner

of the cage, but at nightfall they awaken and become very active. Ant-Eaters in captivity must be kept warm or they will certainly die. The temperature of the air should be as high or higher than that in their deep burrows in the ground.

When sleeping, the head, tail and limbs are folded up after the manner of a sleeping dog.

The Ant-Eater is known as an *Edentate* or toothless animal. It, however, possesses a limited number of molar teeth, usually five in each jaw. Sometimes the lower jaw only contains four. The teeth are loosely set in the sockets, and are quite destitute of enamel. The teeth in the young animals are rounded at the summits, but with wear they become flat. These remarkable teeth which are devoid of enamel and without tapering roots, grow from the bottom upwards during the life of the animal, and are kept from over-development by constant use. They are comparatively soft and easily wear down. The flat base of the tooth when examined, is seen to be full of tiny holes which run upwards. Into each of these, tendrils run, which convey the nourishment for the constantly growing tooth.

The inoffensive and eminently useful Aard Vark is frequently hunted and killed by colonists for the sake of its flesh or hide. By others it is hunted with dogs and destroyed for "sport." This form of so-called sport we might expect to find still active in uncivilised people, but not in educated Europeans.

To destroy wantonly the useful animals of the country which the Creator has provided to maintain the balance of nature, either indicates gross ignorance or callous indifference to the welfare of the people who are courageously struggling to develop all the natural advantages of the country, in order than an ever-increasing number of people may be able to make a livelihood in it.

The Aard Vark is often hunted and killed solely for the sake of its skin which is exceedingly tough and durable, making good straps for yokes.

When chased and hard pressed the Aard Vark gallops with curved back in a series of bounds, aided by its tail.

Although clumsy and ungainly, this curious animal is tremendously strong. We surprised and brought one of them to bay on a moonlight night, and it succeeded several times in actually breaking away from eight stalwart Kaffirs.

Lying in the cover afforded by a dense patch of scrub at dawn, on the look-out for a Leopard which had been attacking stock in the neighbourhood, I saw a dark object pass rapidly along at some little distance, and next instant observed that it had thrown itself upon an animal, which turned out to be a large Aard Vark. The aggressor proved to be a Leopard. The intended victim bunched its body up, and keeping its head out of harm's way between its front legs, it shook the Leopard off repeatedly, and actually dug itself into the earth and escaped.

In leopard-infested districts it is common to find Aard Varks whose hides show old Leopard scars—sometimes the entire back is a mass of healed scars inflicted by the teeth and claws of a Leopard.

Remains of extinct species of Aard Varks have been found in the Pliocene deposits in the island of Samos, and from the Oligocene beds of France.

MAMMALIA

The animals which have been dealt with in this series are Mammals. They belong to the great class known as Mammalia.

A Mammal is commonly known as a warm-blooded animal, that is, an animal which has a fixed bodily temperature which is not affected by external conditions. On the contrary, the bodily temperature of a reptile fluctuates according to the degree of warmth of the air or water in which it happens to be living.

Mammals all possess backbones; they are, as a general rule, covered more or less with hair, and they suckle their young.

With the exception of those remarkable Australian Monotreme animals which lay eggs, all mammals give birth to living young, which are reared on milk secreted by the mammary glands of the mother. In fact, the word Mammal means "an animal with teats." The Mammals as a class are the highest in intelligence of all orders of living creatures. This is due to the superior development of brain. Mammals, of course, vary considerably in intelligence. Those possessing the most complex brain, rank the highest in this respect. Man is at the head of the Mammal class, and the Anthro-

poid or man-like Apes, viz. the Gorilla, Chimpanzee, Ourang and Gibbon come next.

Birds rank as high as a considerable number of families of mammals, but nevertheless the vanguard of mammals is far in advance of birds. The continents and oceans of the world are inhabited by more than 3000 kinds or species of mammals. Whales, Seals and Porpoises are true mammals, although they inhabit the ocean. Their shape and limbs have been modified merely to suit their watery environment.

In the ages long since passed, known as the Eocene and the Miocene, mammals were far more numerous than they are to-day. In fact, during those remote times they swarmed over the face of the earth. The world continued to be a paradise of sub-human animal life until man made his appearance.

With his chipped stone weapons he attacked and slew the mammals, devoured their flesh, and made coverings for his body with their pelts. In this way a good many species or kinds of mammals became extinct, and the rest were considerably reduced in numbers.

The Mammals which are mentioned in these books are those which are known to inhabit Africa south of the Zambesi and Cunene Rivers. The animals are taken in classification order, ending with the Pangolin and Aard Vark or Earth Hog. which are the lowest in the evolutionary scale in South Africa.

CLASSIFICATION OF THE ANIMALS MENTIONED IN THIS BOOK[1]

Order: INSECTIVORA

Animals with teeth adapted to an insectivorous diet. The molars have sharp projecting cusps and the canines are small and weak.

Family: MACROSCELIDIDÆ

(The Jumping or Elephant Shrews)

Small animals with stout bodies, large heads and ears; trunk-like snouts, large bright eyes; long hind limbs, short forelegs; long tails sparsely clothed with hair. Kangaroo-like in shape and attitude.

Colour of fur on back of varying shades of reddish and sandy brown, under parts white.

Skull with large brain case; tympanic bulla swollen; jugal bone imperfect. Molar teeth are broad and have cusps arranged like the letter W.

The family is confined to Africa.

South African species

1. *Macroscelides proboscideus*, Shaw. Cape Jumping Shrew.
2. *Macroscelides melanotis*, Ogilby. Black-eared Jumping Shrew.

1. *Elephantulus rupestris typicus*, A. Smith. Rock Elephant Shrew.
2. *Elephantulus rupestris myurus*, Thos. and Schw. *P.Z.S.*, 1906, p. 586.
3. *Elephantulus rupestris jamesoni*, Chubb. *Ann. Trans. Mus.*, i. No. 3, p. 181 (1909).
4. *Elephantulus intufi*, A. Smith. The Pale Elephant Shrew.
5. *Elephantulus edwardsi*, A. Smith. *P.Z.S.*, 1904.

[1] I am indebted to Mr. M.A.C. Hinton of the British Museum (*Natural History*) for his kindness in revising the Classification.

1. *Nasilio brachyrhynchus*, A. Smith. Short-snouted Elephant Shrew.
1. *Petrodromus tetradactylus*, Pet. Four-toed Jumping Shrew.
2. *Petrodromus schwanni*, Thos. and Wrought. *P.Z.S.*, 1907, p. 288.
3. *Petrodromus beiræ* Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 69.

Family : ERINACEIDÆ

(*The Hedgehogs*)

Small animals covered with short sharp spines.

This family inhabits the British Isles, Europe, Southern Asia and Africa.

South African species

1. *Erinaceus frontalis*, A. Smith. South African Hedgehog.

Family : SORICIDÆ

(*The Shrews*)

Small mouse-like animals with long snouts, the sides of which are more or less swollen by the roots of the numerous whisker bristles. Nostrils open laterally; tip of snout bifid; eyes very small; tail well developed and covered with short bristles intermixed with a few longer white hairs; skull long and narrow; a gland for secreting a defensive musky-smelling fluid at the base of each fore limb.

This family is spread over Europe, Asia and Africa.

South African species

1. *Pachyura varilla*, Thos. The Small Shrew.
2. *Pachyura gratula*, Thos. and Schw. *P.Z.S.*, 1906, p. 781.
3. *Pachyura gracilis*, Blainv.
1. *Crocidura flavescens*, Geoff. The Large Shrew.
2. *Crocidura cinnamomea*, Licht. *Ann. Trans. Mus.*, iv. 1913, p. 79.
3. *Crocidura hirta flavidula*, Thos. and Schw. *P.Z.S.*, 1905, i. p. 264.
4. *Crocidura martensi*, Dobs. Marten's Shrew.
5. *Crocidura pilosa*, Dobs. The Hairy Shrew.
6. *Crocidura silacea*, Thos. The Grey Shrew.
7. *Crocidura mariquensis*, A. Smith.

8. *Crocidura cyanea*, Duv.
9. *Crocidura argentata*, Sund.
10. *Crocidura deserti*, Schw. *P.Z.S.*, 1906, i. p. 103.
11. *Crocidura sylvia*, Thos. and Schw. *P.Z.S.*, 1906, p. 587.
12. *Crocidura pondoensis*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 71.
13. *Crocidura bicolor*, Boc.

1. *Myosorex varius*, Smuts. Smut's Shrew.
2. *Myosorex caffer*, Sund. *Ann. Trans. Mus.*, iv. 1913.
3. *Myosorex sclateri typicus*, Thos. and Schw. *P.Z.S.*, 1905, i. p. 131.
4. *Myosorex sclateri affinis*, Thos. and Schw. *P.Z.S.*, 1905, i. p. 263.
5. *Myosorex sclateri talpinus*, Thos. and Schw. *P.Z.S.*, 1905, i. p. 263.
6. *Myosorex tenuis*, Thos. and Schw. *P.Z.S.*, 1905, i. p. 131.
7. *Myosorex swinnyi*, Chubb. *Ann. Trans. Mus.*, i. No. 2, Supp. 1908.

Family: Chrysochloris

(The Golden Moles)

Small tailless animals with soft short fur bodies adapted for an underground life; eyes rudimentary, represented by tiny black spots beneath the skin; middle toe of each front foot with a very large and strong digging claw.

This family is confined to South and Central Africa.

South African species

1. *Chrysospalax villosa*, A. Smith. Rough-haired Golden Mole. Thos. and Schw. *P.Z.S.*, 1906, p. 163.
2. *Chrysospalax trevelyani*, Gunth. Giant Golden Mole.
3. *Chrysospalax pratensis*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 74.

1. *Chrysochloris asiatica*, Linn. (*aurea* of Sclater). Cape Golden Mole.
2. *Chrysochloris wintoni*, Broom. *Ann. Mag. Nat. Hist.* (7), 19, p. 264 (1907).
3. *Chrysochloris namaquensis*, Broom. *Ann. Mag. Nat. Hist.* (7), 19, p. 266 (1907).

4. *Chrysochloris granti*, Broom. *Ann. Mag. Nat. Hist.* (7), 19, p. 265 (1907).
5. *Chrysochloris sclateri*, Broom. *Ann. Mag. Nat. Hist.* (7), 19, p. 263 (1907).
6. *Chrysochloris duthiæ*, Broom. Duthie's Golden Mole. *Trans. S. Afr. Phil. Soc.*, 18, p. 292 (1907).
7. *Chrysochloris damarensis*, Ogilby.
8. *Chrysochloris gunningi*, Broom. *Ann. Trans. Mus.*, i. p. 14 (1908).
1. *Amblysomus hottentotus*, A. Smith. Red Golden Mole. Cope. *Amer. Nat.*, 26, p. 127 (1892).
2. *Amblysomus hottentotus longiceps*, Broom. *Trans. S. Afr. Phil Soc.*, 18, p. 299 (1907).
3. *Amblysomus hottentotus albifrons*, Broom. *Trans. S. Afr. Phil Soc.*, 18, p. 302.
4. *Amblysomus hottentotus iris*, Thos. and Schw. *P.Z.S.*, 1905, i. p. 259.
5. *Amblysomus hottentotus pondoliæ*, Thos. and Schw. *P.Z.S.*, 1905, i. p. 260.
6. *Amblysomus hottentotus corriæ*, Thos. *P.Z.S.*, 1905, 2, p. 57.
7. *Amblysomus hottentotus albirostris*, Wagn. *Ann. Trans. Mus.*, i. p. 15 (1908).
8. *Amblysomus corriæ septentrionalis*, Roberts. *Ann. Trans. Mus.*, iv. 1913.
9. *Amblysomus tenuis*, Broom. *Ann. Mag. Nat. Hist.* (7), 19, p. 267 (1907).
1. *Chrysotricha obtusirostris typica*, Pet. Peter's Golden Mole. *Trans. S. Afr. Phil. Soc.* (Broom), p. 303 (1907).
2. *Chrysotricha obtusirostris chrysilla*, Thos. and Schw. *P.Z.S.*, 1905, i. p. 261.

CLASSIFICATION OF RODENTIA

Order : **RODENTIA**

Animals with chisel-like incisor teeth adapted for gnawing.

Sub-order : SIMPLICIDENTATA

Division : SCIUROMORPHA

Family : SCIURIDÆ

Squirrels, Flying Squirrels, Marmots, Chipmunks, Gophers etc

Represented in South Africa by Ground Squirrels and typical Tree Squirrels.

Tail more or less bushy; skull with postorbital processes; palate broad; molar teeth rooted and in the young always bear tubercles on the crowns. In the adults these tubercles are usually worn down and converted into deep plates separated by clefts extending partially across the crown.

This family is cosmopolitan in its range, with the exception of Madagascar and Australasia.

South African species

1. *Geosciurus capensis*, Kerr. The Ground Squirrel. *Ann. Mag. Nat. Hist.* (8), 3 (Thomas), p. 467 (1909), (*Xerus* of Sclater).

1. *Paraxerus cepapi typica*, A. Smith. Grey-footed Squirrel.
2. *Paraxerus cepapi sindi*, Thos. and Wrought. *P.Z.S.*, 1908, p. 543.
3. *Paraxerus cepapi soccatus*, Wrought. *Ann. Mag. Nat. Hist.* (8), 3, p. 515 (1909).
4. *Paraxerus sponsus*, Thos. and Wrought. *P.Z.S.*, 1907, p. 292.
5. *Paraxerus palliatus typicus*, Pet. Red-headed Squirrel.
6. *Paraxerus palliatus ornatus*, Gray. *P.Z.S.*, 1864, p. 13, pl. i.
7. *Paraxerus palliatus swynnertoni*, Wrought. *Ann. and Mag. Nat. Hist.* (8), i. p. 305 (1908).

1. *Heliosciurus mutabilis*, Pet.
2. *Heliosciurus mutabilis beiræ*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 78.
3. *Heliosciurus mutabilis chirindensis*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 78.

1. *Funisciurus congicus*, Kuhl. Western Striped Squirrel.

1. *Sciurus carolinensis* (introduced). The Grey Squirrel.

Division: MYOMORPHA

Family: GLIRIDÆ

(*The Dormouse*)

Small rat-like tree-dwelling animals with long hairy tails; large ears and eyes and short fore limbs.

They differ from the Sciuridæ in the following ways—

1. The tibia and fibula (the two lower leg bones) are united at their extremities.
2. The zygomatic or cheek arch is slender. There are no postorbital processes defining the posterior edge of the eye socket.

The Dormice inhabit Africa, Europe and Asia, with the exception of India and the Malay States.

South African species

1. *Graphiurus ocularis*, A. Smith. Large Grey Dormouse.
2. *Graphiurus murinus*, Desm. Cape Dormouse.
3. *Graphiurus murinus tzaneenensis*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 79.
4. *Graphiurus platyops*, Thos. Darling's Dormouse.
5. *Graphiurus nanus*, de Wint. Dwarf Dormouse.
6. *Graphiurus kelleni*, Reuv. Damaraland Dormouse.
7. *Graphiurus griselda*, Schw. *P.Z.S.*, 1906, i. p. 105.
8. *Graphiurus griselda pretoriæ*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 79.
9. *Graphiurus streeteri*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 80.
10. *Graphiurus eastwoodæ*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 80.
11. *Graphiurus woosnami*, Dollman. *Ann. and Mag. Nat. Hist.*, Ser. 8, vi. 1910, p. 396.

Family : MURIDÆ

Sub-family : *Gerbillinæ*

(*The Gerbilles*)

Small rat-like animals with long hind limbs and long hairy tails. Molar teeth in the adults transversely laminated; upper incisor teeth with a longitudinal groove.

Gerbilles are spread over the greater part of the Old World. They occur plentifully in South Africa.

South African species

1. *Gerbillus pæba typicus*, A. Smith. Red Gerbille.
2. *Gerbillus pæba schinzi*, Noack. *Zool. Jahrb.*, 4, p. 134, pl. iii, figs. 13–16 (1889).

1. *Taterona ruddi*, Wrought. *Ann. Nat. Hist.* (7), 17, p. 478 (1906).
2. *Taterona draco*, Wrought. *Ann. Nat. Hist.* (7), 17, p. 479 (1906).
3. *Taterona brantsi*, A. Smith. Brants' Gerbille.
4. *Taterona brantsi perpallida*, Dollman. *Ann. and Mag. Nat. Hist.*, Ser. 8, vi. 1910, p. 394.
5. *Taterona afra*, Gray. Cape Gerbille.
6. *Taterona inclusa*, Thos. and Wrought. *P.Z.S.*, p. 169 (1908).
7. *Taterona lobengulæ typica*, de Wint. Lobengula's Gerbille.
8. *Taterona lobengulæ bechuanæ*, Wrought. *Ann. and Mag. Nat. Hist.* (7), 17, p. 482 (1906).
9. *Taterona lobengulæ griquæ*, Wrought. *Ann. and Mag. Nat. Hist.* (7), 17, p. 483 (1906).
10. *Taterona lobengulæ masbonæ*, Wrought. *Ann. and Mag. Nat. Hist.* (7), 17, p. 483 (1906).
11. *Taterona miliaria typica*, Wrought. *Ann. and Mag. Nat. Hist.* (7), 17, p. 484 (1906).
12. *Taterona miliaria stellæ*, Wrought. *Ann. Mag. Nat. Hist.* (7), 17, p. 485 (1906).
13. *Taterona miliaria salsa*, Wrought. *Ann. Mag. Nat. Hist.* (7), 17, p. 485 (1906).
14. *Taterona panja*, Wrought. *Ann. Mag. Nat. Hist.* (7), 17, p. 485 (1906).

1. *Desmodillus auricularis*, A. Smith. Namaqualand Gerbille. *P.Z.S.*, i. p. 177 (1904).
2. *Desmodillus auricularis pudicus*, Dollman. *Ann. Mag. Nat. Hist.*, Ser. 8, vi. 1910, p. 395.

Sub-family : *Otomyinæ*

(*The Otomys or Vley and Bush Rats*)

Rat-like animals with scaly tails usually less than half the length of the head and body. Upper incisor teeth grooved; posterior upper, and the anterior lower molar the longest. Molars composed of a series of laminæ of enamel united by cement.

The family is confined to South and East Africa.

South African species

1. *Otomys irroratus typicus*, Brants. Vley Otomys.

2. *Otomys irroratus tropicalis*, Thos. *Ann. Mag. Nat. Hist.* (7), 10, p. 314 (1902).
3. *Otomys irroratus auratus*, Wrought. *Ann. Mag. Nat. Hist.* (7), 18, p. 272 (1906).
4. *Otomys irroratus cupreus*, Wrought. *Ann. Mag. Nat. Hist.* (7), 18, p. 273 (1906).
5. *Otomys laminatus*, Thos. and Schw. *P.Z.S.*, 1905, i. p. 267.
6. *Otomys unisulcatus typicus*, F. Cuv. Bush Otomys.
7. *Otomys unisulcatus granti*, Thos. *Ann. Mag. Nat. Hist.* (7), 10, p. 312 (1902).
8. *Otomys sloggetti*, Thos. *Ann. Mag. Nat. Hist.* (7), 10, p. 311 (1902).
9. *Otomys broomi*, Thos. *Ann. Mag. Nat. Hist.* (7), 10, p. 313 (1902).
10. *Otomys brantsi*, A. Smith. Brants' Otomys.
11. *Otomys turneri*, Wrought. *Ann. and Mag. Nat. Hist.* (7), 20. p. 31 (1907).

Sub-family: *Dendromyinæ*

(The Tree Mice)

Mouse-like animals, small and elegant with long scaly tails sparsely covered with hairs. Hind limbs not elongated as is the case with the members of the preceding sub-family. Molar teeth with tubercles or cusps arranged in pairs more or less.

These Tree Mice are confined to Africa.

South African species

1. *Dendromys pumilio*, Wagn. The Small Tree Mouse.
2. *Dendromys jamesoni*, Wrought. *Ann. Mag. Nat. Hist.* (8), 3, p. 247 (1909).
3. *Dendromys nigrifrons*, True. *Proc. U.S. Nat. Hist.* 15, p. 462, fig. 2 (1892).
4. *Dendromys mesomelas*, Brants. Chestnut Tree Mouse.
5. *Dendromys melanotis*, A. Smith. Grey Tree Mouse.
6. *Dendromys longicaudatus*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 83.
7. *Dendromys ayresi*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 83.

1. *Steatomys pratensis*, Pet. The Fat Mouse.

1. *Malacothrix typicus*, A. Smith. Mouse Gerbille.
2. *Malacothrix pentonyx*, W. Scl. Small-eared Mouse Gerbille

Sub-family: *Murinæ*

(*The Rats and Mice*)

The typical rats and mice, with a few closely allied forms, are grouped in this sub-family.

A distinguishing characteristic is that the teeth in the upper jaw have a number of tubercles arranged in three longitudinal rows, and each of these teeth has well-developed roots. When worn down by use the crowns of the molar teeth show transverse bands of enamel.

Their habitat is the Old World, not including Madagascar. No species of this sub-family is represented in the New World (America) except the common Rats and Mice which have been transported there by human agency.

South African species

1. *Rattus rattus*, Linn. The Black Rat.
2. *Rattus norvegicus*, Erxl. The Brown Rat. (*Mus decumanus* of Sclater.)
3. *Rattus nigricauda*, Thos. Black-tailed Rat.
4. *Rattus chrysophilus typicus*, de Wint. Darling's Rat.
5. *Rattus chrysophilus ineptus*, Thos. and Wrought. *P.Z.S.*, 1908, p. 547.
6. *Rattus chrysophilus acticola*, Thos. and Wrought. *P.Z.S.*, 1908, p. 547.
7. *Rattus chrysophilus pretoriæ*. *Ann. Trans. Mus.*, iv. 1913.
8. *Rattus chrysophilus tzaneenensis*, Jameson. *Ann. Mag. Nat. Hist.*, Ser. 8, 4.
9. *Rattus namaquensis typicus*, A. Smith.
10. *Rattus namaquensis centralis*, Schw.
11. *Rattus namaquensis monticularis*, Jameson. *Ann. Mag. Nat. Hist.*, Ser. 8, 4.
12. *Rattus namaquensis lehochla*, A. Smith. Smith's Rat. (*Mus lehochla* of Sclater.)
13. *Rattus namaquensis auricomis*, de Wint. Golden Rat. (*Mus auricomis* of Sclater.)
14. *Rattus damarensis*, de Wint. Damaraland Rat.
15. *Rattus granti*, Wrought. *Ann. Mag. Nat. Hist.* (8), i. p. 257.
16. *Rattus verreauxi*, A. Smith. Verreaux's Rat.
17. *Rattus pœdulcus*, Sund. Wahlberg's Rat.
18. *Rattus colonus*, Brants. Brants' Rat.

19. *Rattus coucha typicus*, A. Smith. White-nosed Rat.
20. *Rattus coucha zuluensis*, Thos. and Schw. *P.Z.S.*, 1905, i. p. 268.
21. *Rattus microdon*, Pet.
22. *Rattus woosnami*, Schw. *P.Z.S.*, 1906, i. p. 108.
23. *Rattus moggi*, Roberts. *Ann. Trans. Mus.*, iv. (2), 1913.
24. *Rattus socialis*, Roberts. *Ann. Trans. Mus.*, iv. (2), 1913.
25. *Rattus illovoensis*, Jentink. *Zool. Jahrb. Syst.*, 28.
26. *Rattus caffer*, A. Smith.
27. *Rattus limpopoensis*, Roberts. *Trans. Mus.*, iv. (4), 1914.
28. *Rattus muscardinus*, Wagn.
29. *Rattus avarillus*, Thos. and Wrought. *P.Z.S.*, 1908, p. 547.
30. *Rattus albiventer*, Jentink. *Zool. Jahrb. Syst.*, 28.

1 *Mus musculus*, Linn. The House Mouse.

1. *Thamnomys cometes*, Thos. and Wrought. *P.Z.S.*, 1908, p. 549.
2. *Thamnomys dolichurus* (Smuts). *Mus* of Sclater.
3. *Thamnomys ruddi*, Thos. and Wrought. *P.Z.S.*, 1908, p. 549.

1. *Leggada minutoides*, A. Smith. The Field Mouse. (*Mus minutoides* of Sclater.)
2. *Leggada minutoides umbrata*, Thos. *Ann. Mag. Nat. Hist.*, 6, p. 312.
3. *Leggada deserti*, Thos. *Ann. and Mag. Nat. Hist.* (8), v. p. 89.
4. *Leggada bella marica*, Thos. *Ann. and Mag. Nat. Hist.* (8), v. p. 88.
5. *Leggada bella induta*, Thos. *Ann. and Mag. Nat. Hist.* (8), v. p. 89 (1910).

1. *Cricetomys gambianus adventor*, Thos. and Wrought. The Giant Rat. *P.Z.S.*, 1907, p. 295.
2. *Cricetomys gambianus cunctator*, Thos. and Wrought. *P.Z.S.*, 1908, p. 171.

1. *Saccostomus campestris*, Pet. The Pouched Rat.
2. *Saccostomus mashonæ*, de Wint. The Mashonaland Pouched Rat.
3. *Saccostomus hildæ*, Schw. *P.Z.S.*, 1906, p. 110.
4. *Saccostomus anderssoni*, de Wint. Anderson's Pouched Rat.
5. *Saccostomus fuscus*, Pet. The Small Pouched Rat.
6. *Saccostomus limpopoensis*, Roberts. *Ann. Trans. Mus.*, iv. (4), 1914.
7. *Saccostomus streeteri*, Roberts. *Ann. Trans. Mus.*, iv. (4), 1914.

1. *Acomys subspinosus*, Waterh. The Spiny Mouse.
2. *Acomys selousi*, de Wint. Selous Spiny Mouse.

1. *Dasymys incomtus typicus*, Sund. Peter's Water Rat.
2. *Dasymys fuscus*, de Wint. *P.Z.S.*, 1896, ii. p. 804.

1. *Lemniscomys dorsalis typicus*, A. Smith. The Single-striped Mouse. (*Arvicanthis* of Sclater.)
2. *Lemniscomys dorsalis calidior*, Thos. and Wrought. *P.Z.S.*, 1908, p. 545. The Single-striped Mouse.
1. *Rhabdomys pumilio typicus*, Sparr. The Striped Mouse. (*Arvicanthis* of Sclater.)
2. *Rhabdomys pumilio bechuanæ*, Thos.
3. *Rhabdomys pumilio deserti*, Dollman. *Ann. Mag. Nat. Hist.*, Ser. 8, vi. Oct. 1910, p. 399.
4. *Rhabdomys pumilio cinereus*, Thos. and Schw. *P.Z.S.*, 1904, i. p. 179.
5. *Rhabdomys pumilio meridionalis*, Wrought. *Ann. Mag. Nat. Hist.* (7), xv. p. 632 (1905).
6. *Rhabdomys pumilio griquæ*, Wrought. *Ann. Mag. Nat. Hist.* (7), xv. p. 632 (1905).
7. *Rhabdomys pumilio intermedius*, Wrought. *Ann. Mag. Nat. Hist.* (7), xv. p. 632 (1905).
8. *Rhabdomys pumilio chakæ*, Wrought. *Ann. Mag. Nat. Hist.* (7), xv. p. 632 (1905).
9. *Rhabdomys pumilio dilectus*, de Wint.
10. *Rhabdomys pumilio moshesh*, Wrought. *Ann. Mag. Nat. Hist.* (7), xv. p. 632 (1905).

1. *Pelomys fallax*, Pet. The Swamp Rat. (*Golunda fallax* of Sclater.)
2. *Pelomys australis*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 90.

Sub-family: *Cricetinæ*

Rat-like animals with cheek pouches and short tails. They are characterized by having two longitudinal rows of cusps on the crowns of their upper molar teeth, instead of three as in the Murinæ.

This sub-family is represented all over the world except Australasia, and includes the only representatives of the great Rodent order found in Madagascar.

In South Africa only one Genus (*Mystromys*) is represented.

South African species

1. *Mystromys albicaudatus typicus*, A. Smith. The White-tailed Rat.
2. *Mystromys albicaudatus fumosus*, Thos. and Schw. *P.Z.S.*, 1905, i. p. 137.
3. *Mystromys albipes*, Wagn. The White-footed Rat.

Family: BATHYERGIDÆ

(*Mole Rats, Blesmols, Sand Moles*)

Burrowing rodent animals of mole-like appearance with conspicuous curved incisor teeth; molar teeth with roots; eyes minute and almost rudimentary; limbs short and provided with strong claws. Body cylindrical; head large and round; nose blunt.

General colour slaty grey.

The members of this family are confined to Africa.

South African species

1. *Bathyergus suillus*, Schreb. The Sand Mole. *Säugeth.*, iv. p. 715, pl. cciv., B (1782). (*Bathyergus maritimus* of Sclater.)
2. *Bathyergus janetta*, Thos. and Schw. *P.Z.S.*, 1904, i. p. 180.

1. *Georychus capensis typicus*, Pall. The Blesmol.
2. *Georychus capensis canescens*, Thos. and Schw. *P.Z.S.*, 1906, i. p. 165.
3. *Georychus damarensis*, Ogil. The Damaraland Blesmol.
4. *Georychus darlingi*, Thos. Darling's Blesmol.
5. *Georychus hottentotus typicus*, Less. The Mole Rat.
6. *Georychus hottentotus talpoides*, Thos. and Schw. *P.Z.S.*, 1906, i. p. 166.
7. *Georychus nimrodi*, de Wint.
8. *Georychus lugardi*, de Wint. *Ann. Mag. Nat. Hist.* (7), i. p. 253 (1898).
9. *Georychus beiræ*, Thos. and Wrought. *P.Z.S.*, 1907, p. 780.
10. *Georychus yatesi*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 92.
11. *Georychus natalensis*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 94.
12. *Georychus jamesoni*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 95.

13. *Georychus arenarius*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 96.
14. *Georychus anomalus*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 96.
15. *Georychus aberrans*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 98.
16. *Georychus pretoriæ*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 98.
17. *Georychus albus*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 100.
18. *Georychus mahali*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 108.
19. *Georychus holosericeus*, Wagn.

Division : HYSTRICOMORPHA

Family : PEDETIDÆ

(*The Springhare or Springhaas*)

A rodent animal of kangaroo-like shape. Fore limbs short and provided with strong claws; hind limbs disproportionately large and with four toes provided with hoof-like nails.

Cheek teeth without roots; the seven vertebræ of the neck separate. Metatarsus elongated; metatarsal bones are not united together.

There is only one species and two local races or sub-species in this family.

They are confined to the southern portion of Africa.

South African species

1. *Pedetes caffer typica*, Pall. The Springhare.
2. *Pedetes caffer orangiæ*, Wrought. *Ann. Mag. Nat. Hist.* (7), xx. p. 32 (1907).
3. *Pedetes caffer salinæ*, Wrought. *Ann. Mag. Nat. Hist.* (7), xx. p. 33 (1907).

Family : OCTODONTIDÆ

(*The Cane Rat, Rock Rat, Gundi, Degu, Coypu, etc.*)

Animals more or less rat-like in shape, with feet generally with five toes armed with long curved claws. The mammæ are placed high up on the body; ears short and sparsely haired. Molar teeth with enamel folds on either side; collar bone complete.

The animals of this family inhabit Africa, West Indies, Central and South America.

South African species

1. *Petromys typicus*, A. Smith. The Rock Rat.
1. *Thryonomys swinderenianus*, Temm. The Cane Rat.

Division : HYSTRICOMORPHA

Family : HYSTRICIDÆ

(*Porcupines*)

Stoutly built rodent animals covered with large spines. Fore and hind limbs of nearly equal length. Front of the skull broad and short. Nasal cavity specially large; in the New World group the molar teeth are fully rooted, the upper lip undivided, collar bone complete and the soles of the hind feet are covered with tubercles.

In the Old World members of the family, the molar teeth are only partially rooted, collar bones incomplete and soles of the hind feet are smooth.

There are a number of species of Porcupines grouped under this family. They inhabit America, Southern Europe, Asia and Africa.

South African species

1. *Hystrix africæ-australis*, Pet. South African Porcupine.

Sub-order : DUPLICIDENTATA

Family : LEPORIDÆ

(*Hares and Rabbits*)

Rodent animals with elongated hind limbs, long ears, short curved tails, thick fur. Eyes large and devoid of eyelids.

The collar bone is imperfect, frontal part of the skull very narrow; three pairs of premolars in the upper jaw and two in the lower jaw.

South African species

1. *Lepus capensis typicus*, Linn. The Cape Hare.
2. *Lepus capensis centralis*, Thos. *Ann. Mag. Nat. Hist.* (7), xii. p. 344 (1903).
3. *Lepus capensis granti*, Thos. and Schw. *P.Z.S.*, 1904, i. p. 182.
4. *Lepus capensis aquilo*, Thos. and Wrought. *P.Z.S.*, 1907, p. 297.
5. *Lepus saxatilis typicus*, Cuv. The Rock Hare.

6. *Lepus saxatilis megalotis*, Thos. and Schw. *P.Z.S.*, 1905, i. p. 271.
7. *Lepus zuluensis typicus*, Thos. and Schw. The Zululand Hare. *P.Z.S.*, 1905, i. p. 270.
8. *Lepus zuluensis micklemi*, Chubb. *Ann. Mag. Nat. Hist.* (8), i. p. 466 (1908).
9. *Lepus zuluensis subrufus*, Roberts. *Ann. Trans. Mus.*, iv. 1913, p. 100.
10. *Lepus gungunyanæ*, Roberts. *Ann. Trans. Mus.*, iv. 1914, p. 184.
11. *Lepus monticularis*, Thos. *Ann. Mag. Nat. Hist.* (7), xi. p. 78 (1903).
12. *Lepus ochropus*, Wagn. *Schreb. Säugeth.*, Suppl. IV. p. 96 (1844).
13. *Lepus ochropus kalaharicus*, Dollman. *Ann. Mag. Nat. Hist.*, Ser. 8, vi. Oct. 1910, p. 400.

1. *Pronolagus crassicaudatus typicus*, Geoff. The Red Hare.
2. *Pronolagus crassicaudatus curryi*, Thos. Curry's Red Hare. *Ann. Mag. Nat. Hist.* (7), x. p. 245 (1902).
3. *Pronolagus crassicaudatus melanurus*, Rüpp.
4. *Pronolagus crassicaudatus randensis*, Jameson. *Ann. Mag. Nat. Hist.* (7), xx. p. 404 (1907).
5. *Pronolagus ruddi*, Thos. and Schw. *P.Z.S.*, 1905, i. p. 272.

Order: CETACEA

Mammals with a fish-like form modified for aquatic life. Hind limbs completely absent externally. Fore limbs reduced to condition of flippers or paddles. Tail horizontal.

Sub-order: MYSTACOCETI

Family: BALÆNIDÆ

(Whalebone Whales)

Whales with no teeth after birth. Instead of teeth the palate is furnished with baleen or whalebone. Breathing orifice double. Skin of throat smooth; head large; no dorsal fin; females larger than the males.

Balæna australis, Desm. The Southern Black Right Whale. *Dict. Class. d'Hist. Nat.*, ii. p. 161.

Megaptera longimana, True. The Hump-backed Whale. *Proc. U.S. Nat. Mus.*, xxi. p. 635 (1898).

Balænoptera sp. The Fin Whale.

Sub-order : ODONTOCETI

Family : PHYSETERIDÆ

(Sperm Whales)

Whales with permanent teeth in the lower jaw. No baleen or whalebone. No functional teeth in upper jaw. The nostrils unite before they reach the surface. Large cavity in the top of the skull. Sternal ribs not ossified. Females smaller than the males.

South African species

1. *Physeter macrocephalus*, Linn. The Sperm Whale or Cachalot. *Syst. Nat.*, 12th ed., p. 107 (1766).
1. *Kogia breviceps*, Gray. The Small Sperm Whale. *Zool. Ereb. and Terror*, p. 22 (1846); Flowers: *List of Cetacea*, *B.M.*, p. 9 (1885).

Family : ZIPHIIDÆ

(Bottle-nosed and Beaked Whales)

Functional dentition reduced to one or two pairs of large teeth in lower jaw. These are larger in males than in females.

Skull prolonged into a beak of strong ivory-like bone. First two cervical vertebræ fused. Flippers placed higher up than in Sperm Whales.

1. *Ziphius cavirostris*, Cuv. Cuvier's Whale. *Ossemens foss*, 2nd ed., v. p. 352 (1823); Flower, *Trans. Zool. Soc.*, viii. p. 207 (1872).
1. *Mesoplodon layardi*, Gray. Layard's Beaked Whale. *Trans. Zool. Soc.*, viii. p. 211 (1872).
2. *Mesoplodon densirostris*, Flower. Blainville's Beaked Whale. *Trans. Zool. Soc.*, x. p. 416 (1878).
3. *Mesoplodon bidens*, Sow. Sowerby's Beaked Whale.

Family : DELPHINIDÆ

(Killers, Porpoises and Dolphins)

Numerous teeth in upper and lower jaws. The two branches of the lower jaw are very much less than half the whole length of the jaw itself. Ribs four to five with double heads. Skull without crests. Sternal ribs ossified firmly.

1. *Orca gladiator*, Lacépède. The Killer or Grampus. *Proc. Zool. Soc.*, 1883, p. 507.
2. *Pseudorca crassidens*, Rein. The Lesser Killer or "False Killer."

1. *Globicephalus macrorhynchus*, Gray. The Cape Black Fish or Ca'ing Whale. *Proc. Zool. Soc.*, p. 509 (1883).

1. *Grampus griseus*, Cuvier. Rissos Porpoise. *Zool. Soc.*, viii. pp. 1, 11 (1871).

1. *Neophocæna phocænoides*, Cuv. The Little Indian Porpoise. *Mamm. India*, p. 574 (1891).

1. *Lagenorhynchus obscurus*, Gray. Gray's Porpoise. True, *Bull. U.S. Nat. Mus.*, No. 36, p. 104, pl. xxix (1889).

1. *Cephalorhynchus heavisidei*, Gray. The Tonine. *Proc. Zool. Soc.*, p. 473 (1883).

1. *Prodelphinus attenuatus*, Gray. The Narrow-snouted Dolphin. *List Cetacea, B. M.*, p. 30, 1885.
2. *Prodelphinus euphrosyne*, Gray. The Euphrosyne Dolphin. *List Cetacea, B. M.*, p. 29, 1885.

1. *Delphinus delphis*, Linn. The Common Dolphin. *Syst. Nat.*, 12th ed., p. 108 (1766).

1. *Tursiops tursio*, Fabr. The Bottle-nosed Dolphin. *Proc. Zool. Soc.*, 1883, p. 478.

1. *Steno rostratus*, Desm. The Rough-toothed Dolphin. *Proc. Zool. Soc.*, p. 482 (1883).

1. *Sotalia lentiginosa*, Owen. The Speckled Dolphin. *Proc. Zool. Soc.*, p. 489 (1883).

Order: EDENTATA

Mammals with a small lobed cerebrum and without median cutting teeth.

Family: MANIDÆ

(*Pangolins*)

Animals with the upper parts of the body and legs covered with horny plates overlapping one another like scale armour; jaws

devoid of teeth; tongue long; mouth small; limbs short, front feet with long digging claws.

The Pangolins are confined to the Old World including Africa.

South African species

1. *Manis temmincki*, Smuts. Scaly Ant-eater or Pangolin. *Enum. Mamm. Cap.*, p. 54 (1832); *S. Afr. Quart. Journal*, ii. p. 176 (1834).

Family: Orycteropodidæ

(*The Ant-eater or Aard Vark*)

Pig-like animals with prolonged snout, small mouth, long and protractile tongue; teeth degenerate and minus enamel; ears large and pointed; tail long and thick; large digging claws.

There is only one species in this family. It is confined to Africa.

South African species

1. *Orycteropus afer*, Pall. Aard Vark or Ant-eater. *Proc. Royal. Soc.*, xlvii. p. 246 (1890).

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